RAILROAD GAZETTE

FRIDAY, MAY 2, 1902.

CONTENTS

ILLUSTRATED:
Specified Loadings for Railroad Bridges. 317
The Burlington Route Test Car. 320
The Organization of the Baltimore & Ohio. 322
Considerations Involved in the Determination of Grades and Alignment. 323
Evolution of the Lehigh Valley Coal Car. 326
The New York & Port Chester Railroad. 331

EDITORIAL:
The Organization of a Railroad. 329
"Per Diem" in Sight at Last. 329
Annual Reports: General Electric Co.; Pennsylvania Steel Co. 329
Editorial Notes 329
New Publications 330
Trade Catalogues 330

MISCELLANEOUS:
Legal Regulation of the Northern Securities Company 317
Report of the Congressional Committee on the Metric System 322
The American Railway Association. 325
The Per Diem Problem on the New Haven Road. . . . 326
The Interstate Commerce Commission's Car-Inspection 327
Fire-Box Stays 330
London Underground Railroad Schemes. 331
Penberthy Boiler Explosion. 331

GENERAL NEWS:
Technical 331
The Scrap Heap. 332
Locomotive Building 333
Car Building 333
Bridge Building 333
Meetings and Announcements. 334
Personal 335
Elections and Appointments. 335
Railroad Construction 335
General Railroad News. 336

Legal Regulation of the Northern Securities Company.*

Two great railroad systems, that of the Great Northern and that of the Northern Pacific, extending through all the States of the far Northwest, had obtained from the public their franchises, and to a considerable extent their property, upon the implied understanding that they would be managed as independent lines. . . . But gentlemen interested in both held among them nearly all of the stock of the two companies. What they could not accomplish directly they decided to seek by indirection. At the expenditure of a trifling amount of cash and of a little stationery they procured for themselves a corporate name and a license to hold under that name the stock of other corporations. They transferred their railroad stock from themselves as individuals to themselves as an incorporated association; and in return they took to themselves as individuals the stock of the new incorporation. They gave to their Managing Committee the title of Board of Directors, and they authorized this board to perform two acts a year. One of these acts was to vote at the stockholders' meeting of the Great Northern, the other was to vote at the stockholders' meeting of the Northern Pacific. The effect was magical. Competition ceased. Consolidation was unnecessary, for the two great railroads were henceforth dominated by a single will. . . . When Minnesota objected, the Minnesota capitalist and his friends met her with this answer: "We are not a combination of people. We are only one person, a citizen of New Jersey. We have the right to own property. The stock of a corporation is property. Its owner can do what he wishes with it. You are only trying to execute the public policy of Minnesota. That policy has no force outside the limits of Minnesota. The only public policy that interests us is that of New Jersey, which is altogether different." . . .

And the corporation's answer is the same; a corporation is a person, a block of stock is just a piece of property, a corporation may own property, and a person, corporate or individual, may use any stock that he owns according to his private judgment.

Now to demonstrate the fallacy of this position I think it is but necessary to lay aside the fictions of corporation law and to return, as the great jurists of the recent as well as the remoter past have always returned when the interest of the public requires, to the true definitions upon which all accurate reasoning must rest. A corporation is only a body of men. . . . These privileges, if granted by a State, must be exercised within that State, unless they receive extension elsewhere from some other sovereignty.

Whatever act this incorporated body of men may perform outside the boundaries of the State by which they were incorporated, must point for its sanction to some provision of the Federal Constitution or statutes, or else to the consent, express or implied, of the State within whose limits the act occurs. If Minnesota wills that men shall not combine to restrain competition in the local traffic of her own territory, what document can they obtain from an official of New Jersey which can lawfully be used to thwart that will? I know of none, if the will is properly expressed. . . . When the New Jersey "person" invested half its property in Minnesota stock, it became a component part of a Minnesota "person," and there was the Minnesota financier returned from his exile and reidentified with his own State, to be governed by its laws, and to be permitted to combine only if those laws allow it. . . .

Minnesota sued first in the Federal court, where every State ought to have the right to go whenever her interests cannot be determined properly in her own tribunals. She failed upon a very technical objection indeed, namely, that the Great Northern was conclusively presumed to be entirely composed of citizens of Minnesota, although really known to be composed mostly of another company whose members are conclusively presumed to be citizens of New Jersey—an objection which was not suggested by any of the lawyers engaged in the case.

Minnesota, driven out of the Federal Courts, brought suit in her own; and now the defendants have removed the case to the Federal Courts again, thus showing that by our strange system of laws, when a controversy arises between a corporation and a sovereign State, the corporation may have a right to choose its forum when the State may not. . . .

I believe that every State holds a legislative remedy in her own hands, because, subject to the moderate restraints of the Constitution of the United States, no combination of individuals may use corporate privileges within her limits, without her consent. . . . The privilege to her own incorporation of subscribing to the stock of other companies she may limit or deny. The corresponding privilege of admitting other incorporations to membership may be likewise limited or denied. The privilege under which corporate control has already been obtained may be put an end to. . . .

Of possible remedies, I need suggest only one. A law that no corporation shall hold more than so much in par value, or so much in proportion, of the stock of any company, will accomplish the result. . . .

*Extracts from a review by Mr. E. B. Whitney, of New York, former Assistant Attorney-General, of the principle of law that corporations may do whatever persons do; presented at a meeting of the American Social Science Association in Washington.

Specified Loadings for Railroad Bridges.

BY WARD BALDWIN, MEM. AM. SOC. C. E.

The writer published in the *Railroad Gazette*, 1894, pages 386, 402 and 479, a list and discussion of the loadings specified in 1893 for railroad bridges, and, believing that a comparison of the loadings specified at the present time with those specified in 1893 will prove of general interest, presents a list of loadings specified in 1901 by the railroads, in the United States, Canada, and Mexico, more than 100 miles long. The loadings specified in 1901 are given in Table I, and a comparison of these loadings with those specified in 1893 is given in table II. The form of loading still most generally used, notwithstanding the many substitutes proposed, is a loading made up of two consolidation engines followed by a uniform load. The only proposed standard loadings that have been at all generally adopted are those proposed by Mr. Theodore Cooper. Very little, if any progress towards standardization of loadings has been made. It will be noticed that a few engineers still adhere to the plan of marking the dimensions of the loadings with microscopic accuracy, a custom that imposes great and unnecessary labor on the computer. A few roads specify alternative loadings with heavy drivers, which give greater stresses on very short spans than the consolidation or other engine used for longer spans. As the writer explained in the paper in the *Railroad Gazette* in 1894, these heavier concentrations give greater stresses only on very short spans, and are of such limited application, that, considering the large impact factor commonly used for short spans, they introduce a complication more troublesome than useful.

The great increase in weight on drivers and in amount of uniform load specified since 1893 is clearly shown in Table II, and may be approximately estimated at about 33 per cent. increase. The tables show so graphically the present views as to what loads should be required that further discussion seems superfluous.

The writer takes this opportunity to illumine some of the early history of the development of the now well known tabular and graphical methods of computing stresses due to wheel concentrations, which seems to be not well known.

Thus, in the recent work of Prof. Johnson on modern framed structures, the happy expedient of ascribing a graphical diagram devised by the writer to "The Cincinnati Southern Railway Office" is adopted as a safe and impersonal way of dealing with this ancient history. So far as the writer is aware, the first concentrated loading specified in this country was that contained in the bridge specifications issued by the Cincinnati Southern Railway in 1875. At this time Thomas D. Lovett was Chief Engineer, G. Bouscaren was Engineer in charge of bridges, and C. L. Strobel was Engineer in charge of the office work. The task of formulating methods for determining the stresses due to wheel concentrations was in able hands, and, although these gentlemen have with customary modesty refrained from publishing the results of their labors, it is within the knowledge of the writer, who later was Principal Assistant in charge of the office of the Cincinnati Southern Railway, that complete and satisfactory methods of dealing with wheel concentrations were used in proportioning the bridges built on the Cincinnati Southern in the early seventies. There are indeed to-day a number of graphical diagrams on file in that office, containing stepped load lines and moment lines, which diagrams were used in making the strain sheets of these old bridges. On a number of these diagrams the moment line is drawn and is used as an equilibrium polygon. These diagrams seem to have been mostly prepared by Mr. Strobel, who at that time had recently returned from his engineering study abroad under Prof. Mohr, and was familiar with the latest applications of the equilibrium polygon and shear diagram. The credit due to Mr. Strobel for this early work has not been generally known although some reference has been made to it in several publications, notably by the writer in the *Engineering News*, Aug. 30, 1890, page 180.

In 1882, the writer prepared for his own use a table of moments, computing the sums of the moments of the wheels about the first wheel as an origin of moments, and later prepared a diagram containing a stepped load line with these moment sums written on the respective wheels. This diagram was used for several years in the Cincinnati Southern office in computing strain sheets analytically. In 1884 Mr. W. H. Schuermann, who had, during the previous year, been a draftsman in the office of the Cincinnati Southern Railway, published a paper in the Proceedings of the Western Society of Civil Engineers on the subject of concentrated loadings, in which he erroneously credited the writer with the discovery of the use of the stepped load line, and described the well known properties of the moment line used as an equilibrium polygon. In 1889 the writer published a paper in *Engineering News*, Vol. XXII, page 295, in which he described the methods in practical use by him for dealing with wheel concentrations, and described a quick and accurate method devised by him for drawing the moment line, and for using the stepped line and moment line with the help of a thread, the diagram being drawn on profile or other ruled paper.

This graphical construction was devised by the writer in 1888 and was used from that time in place of the analytical method in all bridge computations made in the Cincinnati Southern Railway office. This diagram is reproduced in the valuable paper on Concentrated Loadings published by Prof. H. T. Eddy, in the Transactions of the Am. Soc. C. E., Vol. XXII, and due credit is given on page 306. The diagram is also copied in Prof. Johnson's "Modern Framed Structures," as noted above. It has been generally known that some of the pioneer work in formulating short methods for dealing with concentrated loadings was done by engineers who were at the time with the Cincinnati Southern Railway, but when the knowledge of the differentiation of this work is so vague that the work can only be attributed to the "office" the need of enlightenment seems apparent.

TABLE II.—Number of Independent Roads Which Specify.

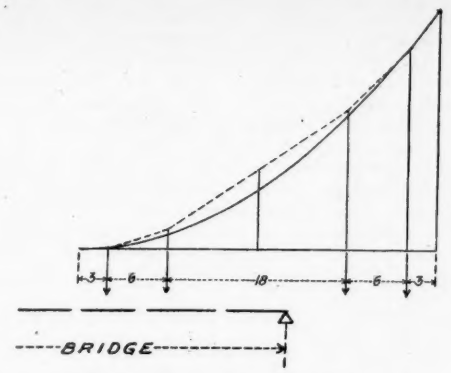
A driver load of.	In the Year 1893	In the Year 1901	A uniform load of.	In the Year 1893	In the Year 1901
22,000	1	0	2,240	1	0
23,000	1	0	3,000	37	4
24,000	12	0	3,200	1	4
24,640	1	0	3,500	6	3
28,000	4	0	3,600	1	1
28,600	1	0	3,700	0	1
30,000	34	0	4,000	29	50
31,000	1	0	4,200	2	3
32,000	1	0	4,400	0	1
32,500	2	0	4,500	0	14
33,750	0	1	4,600	0	1
34,000	1	1	4,800	0	2
35,000	5	5	5,000	0	17
36,000	1	1	6,000	0	1
Average.					
36,600	1	0	6,600	0	1
Average.					
37,000	2	4	.....	..	..
38,000	0	1	.....	..	..
40,000	6	29	.....	..	..
42,000	0	4	.....	..	..
43,000	0	1	.....	..	..
44,000	1	11	.....	..	..
44,400	0	1	.....	..	..
45,000	0	8	.....	..	..
47,000	0	2	.....	..	..
48,000	0	1	.....	..	..
49,000	0	1	.....	..	..
50,000	0	19	.....	..	..
54,000	0	1	.....	..	..
60,000	0	1	.....	..	..

The use of loadings in which two engines are followed, or preceded and followed, by a train of car wheel concentrations seems to have been adopted by some engineers as an improvement on the usual loading of two engines and a uniform train load. But a little consideration will show that by the use of wheel concentrations for the trainload there is only a nominal gain in accuracy at the expense of a substantial increase of the labor of computation.

The moment or shear at any point of a bridge due to the weight of one of the cars composing the train is exactly the same whether the carload is considered to be uniformly distributed or is considered to be concentrated on the wheels, provided the car is entirely on the bridge and also provided the car is not over the point at which the moment or shear is being computed. This is evident because the weight of the car, for purposes of calculation, may be considered to be concentrated at the middle of the car whether the carload is taken as uniform or as concentrated. In general when the loading is in a position to produce the maximum moment or shear and a car is just entering or leaving the bridge, both engines are on the bridge, and the proportional part of the given moment or shear due to the fractional part of the car at the end of the span is small, as is readily seen when it is remembered that the moment or shear due to this carload is proportional to the part of the fractional carload on the bridge that is supported at the farther pier. The difference in reaction at the farther pier due to considering this fractional carload concentrated instead of uniform is quite small, as appears from an inspection of the accompanying diagram, in which the ordinates at any point to the full and dotted lines represent respectively the reaction at the farther pier due to the part of the carload on the left of the ordinate, considered respectively as uniform and concentrated, when the part

TABLE I.

| | Railroad | Length Miles | Loading | | |



of the carload on the left of the given ordinate is on the span. Clearly then, for the part of the train not over the point at which the maximum moment or maximum shear occurs, there is no substantial gain in accuracy by considering the trainload to be concentrated. It remains to consider the effect of the carload which is over the point of maximum moment or maximum shear. The maximum shear always occurs under the head of the train, and hence a car is never over the point where the maximum shear exists. The maximum moment exists in general under the heaviest part of the load, and hence, when the train precedes as well as follows the engines, a car is never over the point where the maximum moment exists. The only case in which a car may be over the point where the maximum moment exists is in case of a span of considerable length, at least more than twice the length of the engine load, and where the engines are not preceded by the train. In this case there will be at least two engines between the given point and the pier. So far as the reaction, and therefore the part of the moment due to the reaction, is concerned, the same value will be found whether the carload over the given point is considered uniform or concentrated, and therefore the only part of the moment that will be affected by the distribution of the carload over the given point is the subtractive moment of the part of the carload on the left of the given point. The same diagram referred to above may be used to represent the relative values of this moment for the uniform and concentrated carload, and shows clearly that these values are substantially equal. The above considerations show that the division of the trainload into wheel concentrations is practically a valueless refinement, and that it would be better practice to specify a uniform trainload.

The Altenbecken accident, as the Germans call it, in which an express train halted on a block section to remove a dead horse from under the engine, and was run into by a following train in consequence of a failure of block working, has come before the criminal court. The block-signalman is sentenced to nine months' imprisonment, and the conductor of the express to six weeks. The offence of the latter was neglecting to send back a signal. Both men had served long and reputably.

TABLE I.—CONTINUED.

	Railroad	Length Miles	Loading		Alternative Loading
46	Ill. Cent.	3678	23 8′ 40 5′ 49 5′ 49 5′ 49 8′ 20 5′ 20 5′ 20 5′ 20 8′	2d ENGINE. 4′ 4600	50 7′ 56
47	Chic. Mil. & St. P.	6337	25 6′ 25 5′ 50 5′-6″ 50 5′-6″ 50 10′ 30 5′ 30 6′ 30 5′ 30 8′	" " 5′ 4000	
48	Chic. Bur. & Q.	7594	20 8′ 50 5′ 50 5′ 50 5′ 50 10′ 26 5′ 26 5′ 26 5′ 26 10′	" " 4′ 4000	
49	Kan. City & Sou. Chic. & Alton	888 901	20 8′ 4″ 50 5′-3″ 50 5′-3″ 50 5′-3″ 50 10′ 26.4 5′ 26.2 7′ 26.2 5′ 26.2 8′	" " 4′ 5000	
50	Carson & Col. Sou. Pac.	300 7417	20 8′ 50 5′ 50 5′ 50 5′ 50 9′ 30 5′ 30 6′ 30 5′ 30 8′	" " 5′ 4500	
51	Det. & Mackinac. Mich. Cent.	320 1657	20 7′ 50 5′ 50 5′ 50 5′ 50 10′ 31 4½′ 31 6½′ 31 4½′ 31 8′	" " 4′ 4000	
52	Wabash.	2360	30 8′ 50 4′-6″ 50 4′-6″ 50 4′-6″ 50 10′ 32 5′ 32 5′ 32 5′ 32 8′	" " 4′ 6″ 4000	
53	Del. Lack. & W.	900	22 7′ 50 5′ 50 5′ 50 5′ 50 9′ 28 5′ 28 5′ 28 5′ 28 8′	" " 4′ 4500	
54	Minn. & St. L.	509	25 8′ 50 5′ 50 5′ 50 5′ 50 10′ 30 5′ 30 6′ 30 5′ 30 10′	" " 4′ 5000	
55	Or. R. R. & Nav. Co. Or. Sht. Line. Union Pac.	1065 1496 2848	25 8′ 50 5′ 50 5′ 50 5′ 50 10′ 30 5′ 30 6′ 30 5′ 30 10′	" " 5′ 4000	
56	Chic. & E. Ill. Cin. Nor. Wis Cent. Minn. St. P. & S. St. M.	208 1016 1272	C. 25 8′ 50 5′ 50 5′ 50 5′ 50 9′ 32.5 5′ 32.5 6′ 32.5 5′ 32.5 8′	" " 5′ 5000	
57	Lehigh Valley.	661	C. 25 8′ 50 5′ 50 5′ 50 5′ 50 9′ 32.5 5′ 32.5 6′ 32.5 5′ 32.5 8′	" " 5′ 5000	55 7½′ 55
58	Cin. N. O. & T. Pac.		24 8′ 54 4′-6″ 54 4′-6″ 54 4′-6″ 27 8′ 28 4′ 30 6′ 30 4′ 30 8′	" " 3′ 5000	
59	Pitt. Bess. & L. E.	226	25 8′ 60 5′ 60 5′ 60 5′ 60 8′ 30 5′ 30 6′ 30 5′ 30	6600	
60	Carolina & N. W.	109	16 8′-1″ 36 4′-11″ 30 4′-11″ 40 4′-3″ 30 12′-10″ 20.5 5′ 20.5 5′-7″ 22.5 5′ 22.5 7′-5″	7′ 35 6′ 35 18′ 35 6′ 35 9′	
61	Wheeling & L. E.	247	* 7′ 20 8′ 40 5′ 40 5′ 40 5′ 40 9′ 30 5′ 30 6′ 30 5′ 30 8′	" " 7′ 37 6′ 37 16′ 37 6′ 37 8′	
62	Lake S. & M. Sou.	1413	20 5′-10″ 20 4′-11″ 43 9′ 47 8′ 44 11′-4″ 30 5′-6″ 30 5′-6″ 30 5′-6″ 30 6′-1″	5′-6″ 38 17′ 38	5′-6″ 38 6′-2″ 38 5′-6″ 38 17′ 38 5′-6″
63	Clev. Lorain & Wh.	192	21 6′ 21 4′ 46 7′ 54 8′ 46 12 28 5′ 28 6′ 28 5′ 28 9′	2d ENGINE. 7′ 37.5 6′ 37.5 16′ 37.5 6′ 37.5 6′	
64	N. Y. O. & West.	480	22 7′-11″ 45 5′-3″ 45 5′ 45 5′ 45 12′-2″ 25 5′-2″ 25 6′-5″ 25 5′-2″ 25 8′-6″	" " 7′ 4″ 29 5′-4″ 29 21′-10″ 29 5′-4″ 9 8′ 2″	
65	Northern Pac.	4871	* 18 6′-9″ 18 4′-5″ 39 6′ 42 4′-5″ 40 5′ 39 1.′ 24 5′ 24 5′-6″ 24 5′ 24 8′	" " 8′ 4000	
66	Texas Cent.	178	Two 80½ ton engines.	3000	
67	Sou. Indiana.	150	* 116 ton engine.	3000	
68	Central of Ga.	1581	Two 104 ton engines.	4000	
69	Seaboard Air Line. Fla. Cen. & Penn.	961 940	125 ton engine.	1800	
70	Missouri K. & Texas.		Two 125 ton engines.	4000	
71	Duluth Missabe & N.	143	Two 125 ton engines.	4000	
72	Sante Fe. Pres. & Phoe.	224	Two consol. engines, 44,000 pounds on each driver.	3200	
73	Rutland.	135	W. 20 8′ 40 5′ 40 5′ 40 5′ 40 8′ 23 5′ 23 5′ 23 5′ 23 8′	" " 4000	
74	C. C. C. & St. L.		Two consol. engines, 50,000 pounds on a driver.	5000	
75	St. L. K. C. & Col.	552	Three 130 ton consol. engines.	4000	
76	Penn. L. W. of Pitt.		Concentration of 50,000 pounds. Concentration of 40,000 pounds.	5000 4000	
77	Bangor & Aroostook.	321	* 56 14′ 56 50′ 56 14′ 56 concentrations.	6500 to 8000	
78	Norfolk & W.	1551	* 10′ 45 5′ 45 5′ 45 5′ 45 10′	4000	
79	Fla. E. Coast.	515		4400	
80	Omaha K. Cit. & E.	171		4500	

C prefixed to a loading signifies Cooper's loading. W prefixed to a loading signifies Waddell's loading. * prefixed to a loading signifies that a uniform load precedes the engines.

The Burlington Route Test Car.

This car, first built in 1885, has an interesting history. It has had part in a number of important and notable tests, among others the famous Burlington Brake Tests of 1886 and 1887. As originally built a twin-spring dynamometer was used. The car was entirely remodeled in 1901, a hydraulic dynamometer being substituted for the spring device and a gas analysis apparatus added. The following illustrated description of this car was furnished by Mr. Max H. Wickhorst, Engineer of Tests, who had charge of the work of remodeling. Mr. Wickhorst assigns special credit to his assistant, Mr. C. C. Higgins, who made the designs and drawings and looked after the construction.

The Burlington Route Test Car contains an oil dynamometer for measuring train resistance, an Orsat gas analysis apparatus for analyzing smokebox gases or products of combustion, an air-brake recorder, steam-pressure recorder, smokebox vacuum recorder, Boyer speed recorder, and several electric counters. The important part of the equipment consists of the dynamometer and the gas analysis apparatus, and this description will be confined mostly to the hydraulic dynamometer with its automatic recording mechanism.

The car body is similar to the regular Burlington way cars, being 30 ft. 9 in. outside of the sills, 30 ft. long by 8 ft. 6 in. wide inside, with a platform on each end, and has a convenient cupola situated over the recording table and seating four men comfortably. A general plan of the car is shown in Fig. 1. One end contains the dynamometer, large gage-board recording table, gas analysis apparatus and work benches, while the other end contains seats and sleeping accommodations.

The dynamometer consists of an oil cylinder or oil "jack" 10 in. in diameter with a piston of 5-in. face, having a 2½-in. rod, and 4 in. of free movement. There is no packing around either the piston or rod; both are ground fits, but are entirely free in movement. This makes an expensive construction, but does away with friction in the dynamometer. The cylinder is designed to withstand a pressure of at least 1,000 lbs. per sq. in., which is equivalent to a tractive pull of over 75,000 lbs. The general principle is the same as that used by Prof. L. P. Breckenridge, of the University of Illinois, but the Burlington dynamometer has only one piston, which is double acting; that is, it is suitable for either pull or push. When in testing service, the drag of the train comes on the cushion of oil and an automatic record of the oil pressure thus developed is traced by a suitable mechanism. In addition to the oil cylinder there is a twin-spring draft arrangement which can be made to take the drag of the train and thus cut out the dynamometer and save any strain on it. To do this it is simply necessary to open a by-pass to allow free circulation of the oil between the two ends of the cylinder, and put in filler blocks to fill in the space between the springs and encircling yoke.

The recording arrangement is somewhat similar in principle to a steam indicator, consisting of two cylinders 9/16 in. in diameter, or about ¼ sq. in. area, placed on each end of a bed plate with the piston rod extending from one to the other. The general arrangement is shown in Figs. 2 and 3. The piston rod is held in place by two springs, each under compression of one-half its capacity; each of the springs has a seat on one end against one of the small cylinders and the other end against a collar, fastened to the piston rod. Pressure on either end of the piston rod will compress one spring and release the other. As one cylinder is piped to the front end of the dynamometer and the other to the back end, the recorder is thus made double acting. The movement of the piston rod is amplified by a lever-arm giving a multiplication of ten and producing a straight-line motion with correct multiplication. The ordinate obtained with a given pressure may be varied by using different capacity springs in the recorder. The aim is to get an average ordinate of 3 or 4 in. The records are taken by means of stylographic pens, one of which draws a datum line, or line of zero draw-bar pull, which remains stationary and is set before starting. The draw-bar recording pen gives an ordinate varying with the draw-bar pull or pressure in the dynamometer.

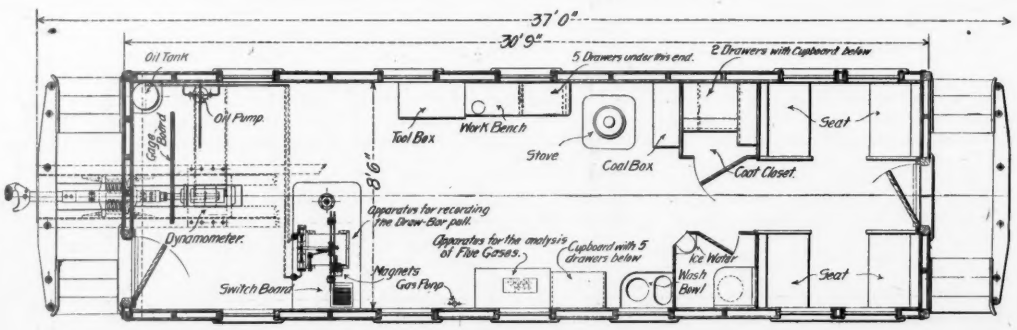


Fig. 1.—Plan of C. B. & Q. Test Car.

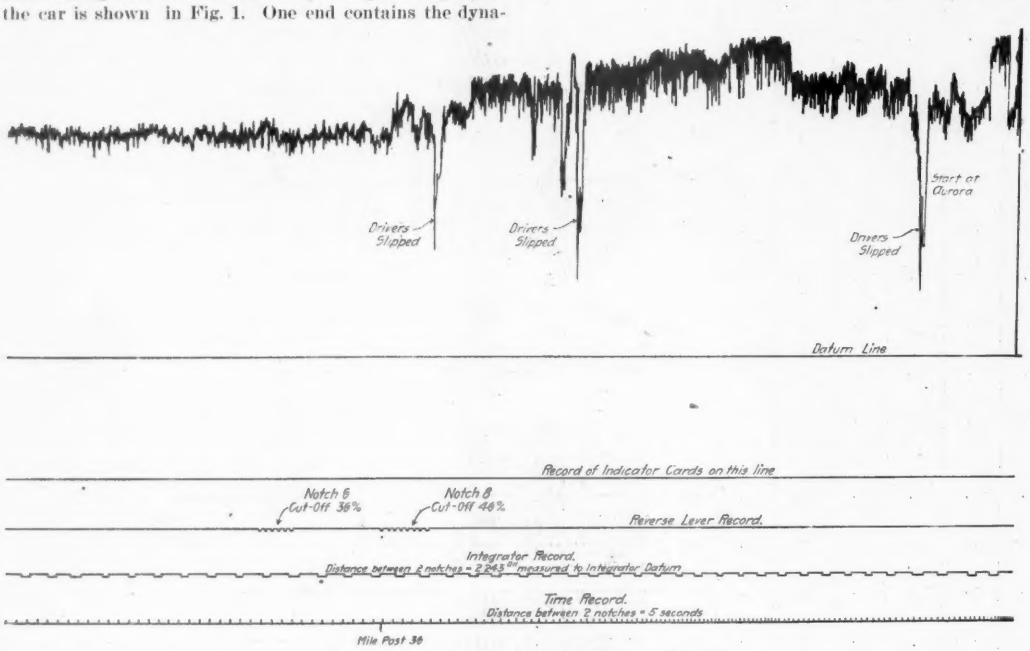


Fig. 5.—Specimen of Dynamometer Record.

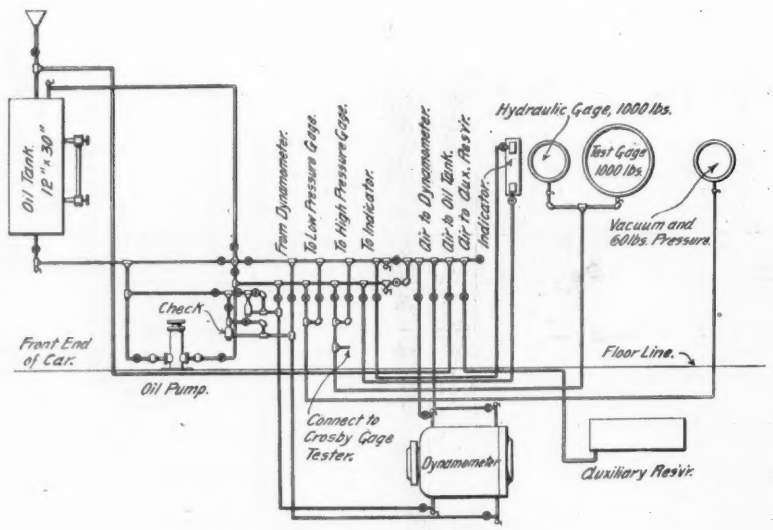


Fig. 4.—General Arrangement of Piping.

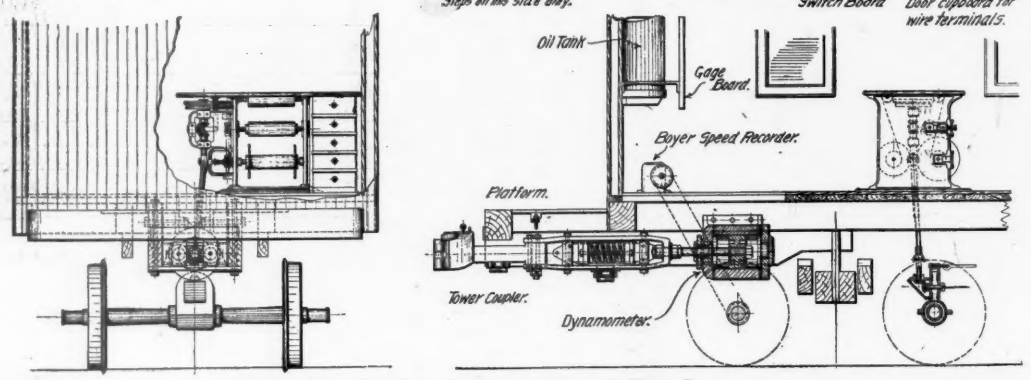


Fig. 2.—General Arrangement of Test Car.

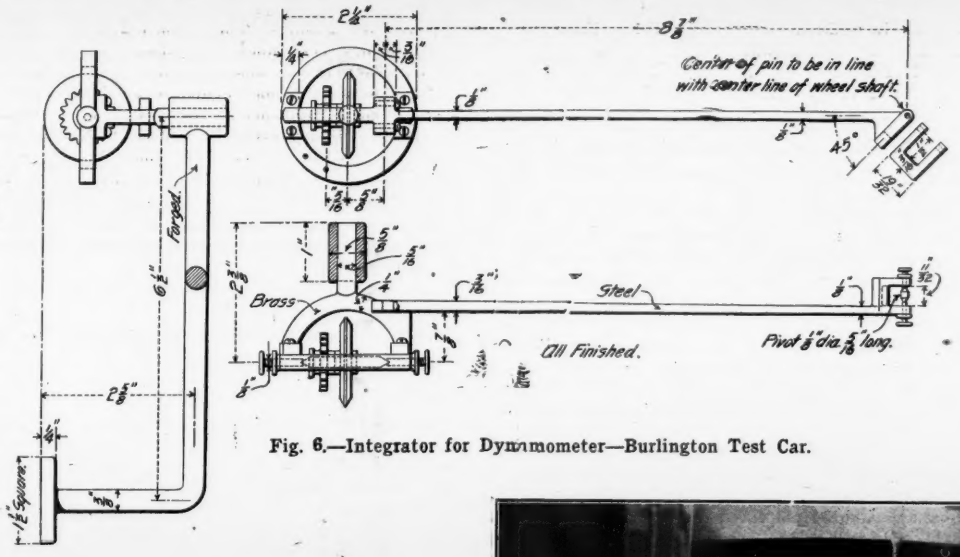


Fig. 6.—Integrator for Dynamometer—Burlington Test Car.

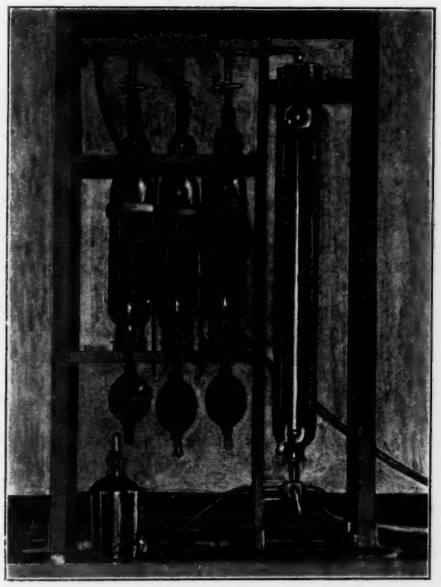


Fig. 8.—Orsat Gas Analysis Apparatus.

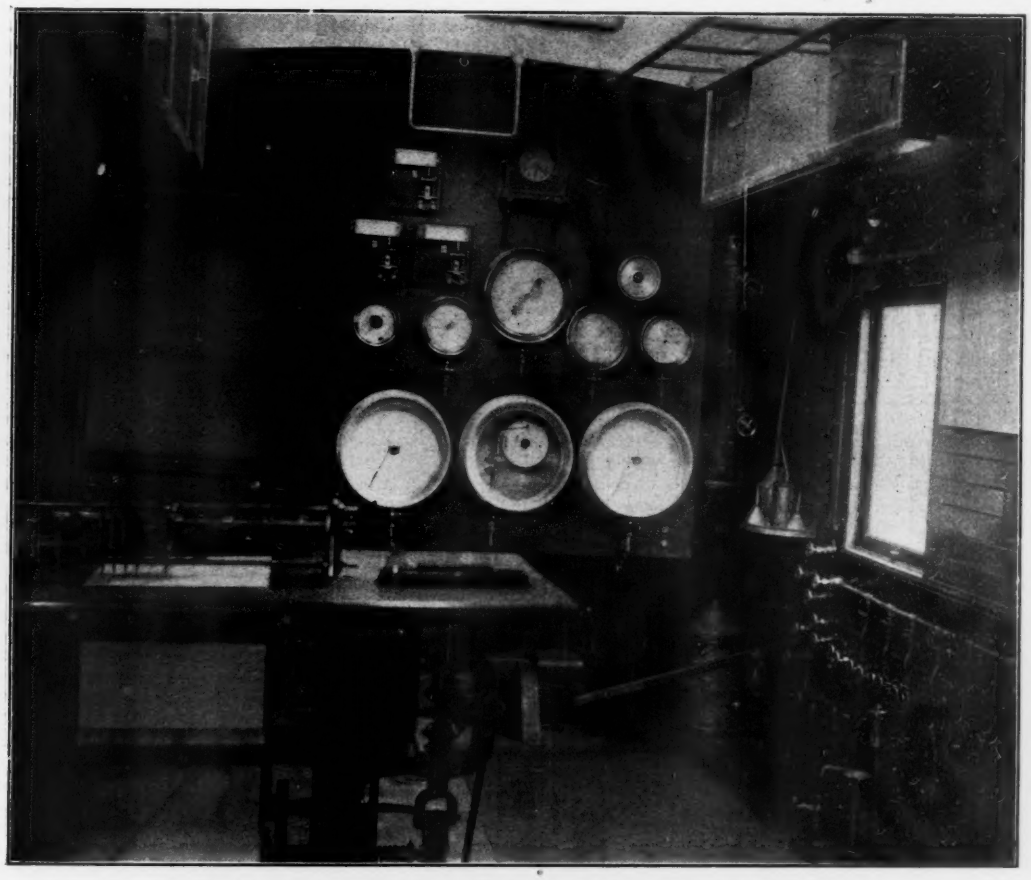


Fig. 7.—Gage Boards, Recording Apparatus and Piping—Burlington Test Car.

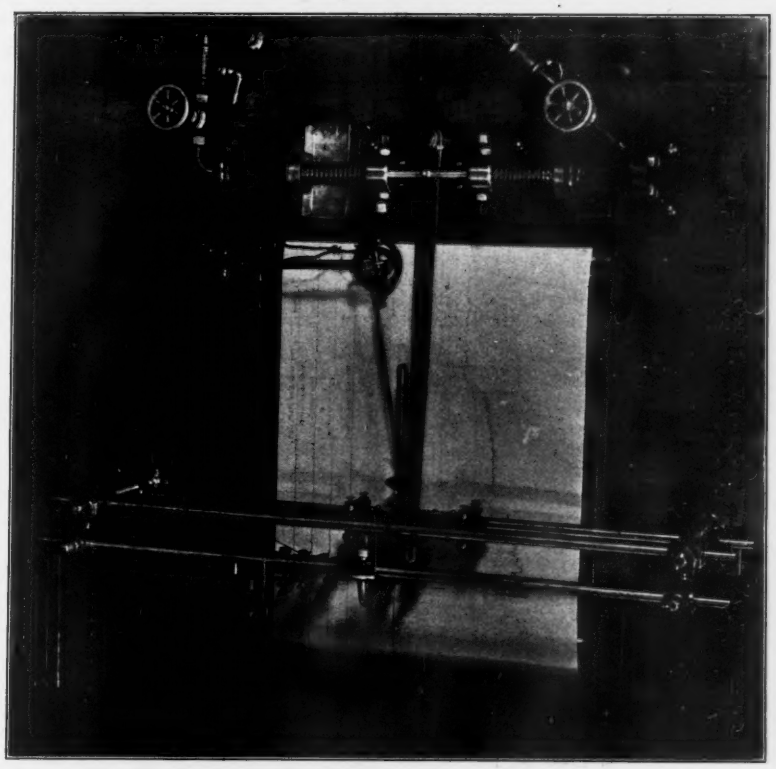


Fig. 3.—Recording Apparatus and Mechanical Integrator.

pen is forced to one side and allowed to come back slowly and the bed plate of the recorder tapped with a couple of mallets while the paper is pulled through slowly until the recording pen becomes stationary. The recording pen is then forced to the other side and the same procedure gone through with. If there is no undue lost motion, and the recording piston has no undue friction, the two lines thus obtained will very nearly coincide. The valves are now opened so that pressure produced by the gage tester is transmitted to one end of the recorder while the other end is opened free to the atmosphere; care is taken to have the gage tester brought level with the recorder, or else correction is made for difference produced by the head of oil. Pressures are now produced by means of the gage tester, starting with say 20 lbs. per sq. in. and using increments of 20 lbs. up to the desired limit of 200 or 300 lbs. per sq. in. At each pressure the corresponding ordinate is obtained in the same manner as in testing the datum line. Having these various ordinates corresponding to various pressures per sq. in. and knowing the area of the dynamometer piston and piston rod, the corresponding draw-bar pull can be calculated. From this a calibration chart is plotted showing ordinate in inches horizontally and the draw-bar pull vertically. This chart contains two lines, an upper one which is the result or calibration just as obtained, and a lower one as corrected, due to the gage tester being on the floor of the car about two feet below the recorder. This calibration requires about 10 or 15 minutes, and is made with everything in place ready for service. During a series of tests a number of calibrations are made, and the datum line tested before and after each trip.

In service, when the engine is pulling, the back end of the dynamometer is open to the oil tank through the check valve, described above, and also to the back end of the recorder; while the front end of the dynamometer is open only to the front end of the recorder. The oil head in the tank acting through the dynamometer produces pressure in the front end of the recorder, but it also acts directly on the back end of the recorder, and the two thus neutralize each other. Any oil head in the tank or for that matter, any excess pressure or vacuum that may occur in the back end of the dynamometer while the engine is pulling has no effect on the recorder, and only the pressure in the front end of the dynamometer, due to the pull of the engine, is recorded.

The mechanism for feeding the record paper is shown in Fig. 2. It consists of a worm and gear on the axle under the recording table which drives a shaft running up into the car. This in turn drives a train of gearing by which motion is transmitted to a brass feed roll. Paper is passed by this brass cylinder and made to press against it by means of a rubber roll. As at present constructed, the paper may be fed either at the rate of about one foot of paper to the mile of track, or two feet to the mile. For most work, a feed of one foot to the mile is used, although for a great deal of the train resistance work the feed of two feet to the mile is used, and sometimes it would be desirable to have a still greater feed of paper.

Besides a record of draw-bar pull, provision is made for obtaining records of distance, location, time, reverse-lever positions, places where indicator cards were taken, integrator record showing area of dynamometer diagram and at times other records. The recording apparatus consists of eight electro-magnets and four pens, each pen being connected with two of the electro-magnets and arranged so that one electro-magnet deflects the pen in one direction and the other in the opposite direction.

A sample record is shown in Fig. 5. To locate mile posts, stations, etc., an observer is stationed in the cupola, and as the car passes a mile post he pushes a button which actuates an electro-magnet, and this in turn deflects a recording pen, making a notch in the record line. Time is recorded by a clock which closes a circuit every five seconds, and this notches the same line in the opposite direction. Reverse-lever positions are recorded by an observer in the engine cab pressing a button an appropriate number of times: the places indicator cards are taken are recorded in a similar manner by an observer on the front end pressing a button just before taking the card. The various wires running from the engine into the car are collected into one cable and suitable terminals are placed in the car and on the end

of the cable to allow connecting or disconnecting quickly.

The mechanical integrator, Fig. 2 and 6, is a very important and useful adjunct and automatically records the area of the dynamometer diagram as it is produced. The integrator consists of a wheel 1½ in. in diameter the plane of which at zero ordinate is about at right angles to the line of motion of the paper; as the draw-bar ordinate increases, the plane of the wheel is rotated and the wheel thus revolves as the paper moves under it. The number of revolutions of the wheel is a function of the length of the paper passing under it and the length of the ordinate; that is, it is a function of the area of the dynamometer diagram. The integrator wheel also has attached to its shaft a small commutator having 20 contacts on its circumference and each time a contact is made, it actuates one of the recording pens. The dimensions of the instrument are such that each contact or notch in the record line equals 2.243 sq. in. of area of dynamometer diagram above the integrator zero line. In practice it is usual to set the integrator so that the integrator zero line is somewhat below the draw-bar zero line, and then determine what is the constant difference between the two lines; the integrator zero line is not, however, actually drawn. To determine the average ordinate of a given length of diagram, the number of integrator notches included in this length is counted; this is then multiplied by 2.243 and divided by the length of the diagram; finally the constant is subtracted, which gives the average ordinate of the dynamometer diagram. From the calibration chart the corresponding draw-bar pull is found. In Vol. 22, 1901, of the transactions of the American Society of Mechanical Engineers, page 33, is a description of the mechanical integrator used with the old dynamometer. The principle of the present integrator is somewhat different and was copied from one used by the Pennsylvania.

The various wires of the car come to terminals on one switchboard placed on the recording table. This switchboard will take care of 12 push-buttons or places for making contact, also of 12 electro-magnets. At present there are seven independent lines where circuits can be made, and 11 independent electro-magnets; eight of these are used for actuating pens and three for actuating counters. For batteries, there are 30 ordinary ammonium-chloride wet cells arranged in three sets of ten each. The batteries are arranged in multiple-series with two cells in each series, thus giving a pressure of about two volts. The various push-button circuits have a common return, the various electro-magnets have a common return, and the batteries also have a common return.

The gage-board is shown in Fig. 7. This board has the clock which makes a circuit every five seconds, three electric counters which can be used for counting air pump strokes, etc., dynamometer gages, Boyer speed gage, air gage showing both train line and brake cylinder pressure, recording train-line pressure gage, recording smokebox vacuum gage, steam gage showing boiler pressure in the engine, and recording steam gage.

The gas-analysis apparatus is shown in Fig. 8, and is an Orsat apparatus as modified by A. Bement, and was obtained from him. A pipe extends into the smokebox of the locomotive, ordinarily just back of and below the exhaust nozzle. From the smokebox it runs back into the test car, a suction pump being placed in the car to draw the smokebox gases through the apparatus. Care is taken to see that the pipe line is tight by closing a small pet-cock placed just outside of the smokebox, producing a slight vacuum in the pipe and then noting by means of a column of water in a glass tube if this vacuum is sustained. The various absorbent solutions are potassium hydrate for absorbing carbon dioxide ($C\ O_2$), pyrogallic acid for absorbing oxygen (O), and cuprous chloride for absorbing carbon monoxide (C O).

Below is given a list of the more important tests made with the car since it was built, the test made in 1901 being with the remodeled car. This list is not at all complete, but gives an idea of the various uses that have been made of the test car.

1885—Tests made of tractive force of various engines.

1886-87—Burlington Brake Tests made for Master Car Builders' Association from Burlington, Iowa, to Middletown, Iowa.

1886—Relative tractive power with 53-in. and with 57-in. wheel center. Comparison of engines with 17 and 18-in. cylinders.

1887—Comparison of four engines in passenger service; coal, water, dynamometer records and indicator cards.

1891—Tests of C., B. & Q. compound engine No. 324 and simple engine No. 75.

1892—Tests of six engines in passenger service, four simple and two compound; coal, water, indicator cards, and dynamometer records.

1894—Tests of five engines in freight service, three simple and two compound; coal, water, indicator cards, and dynamometer records.

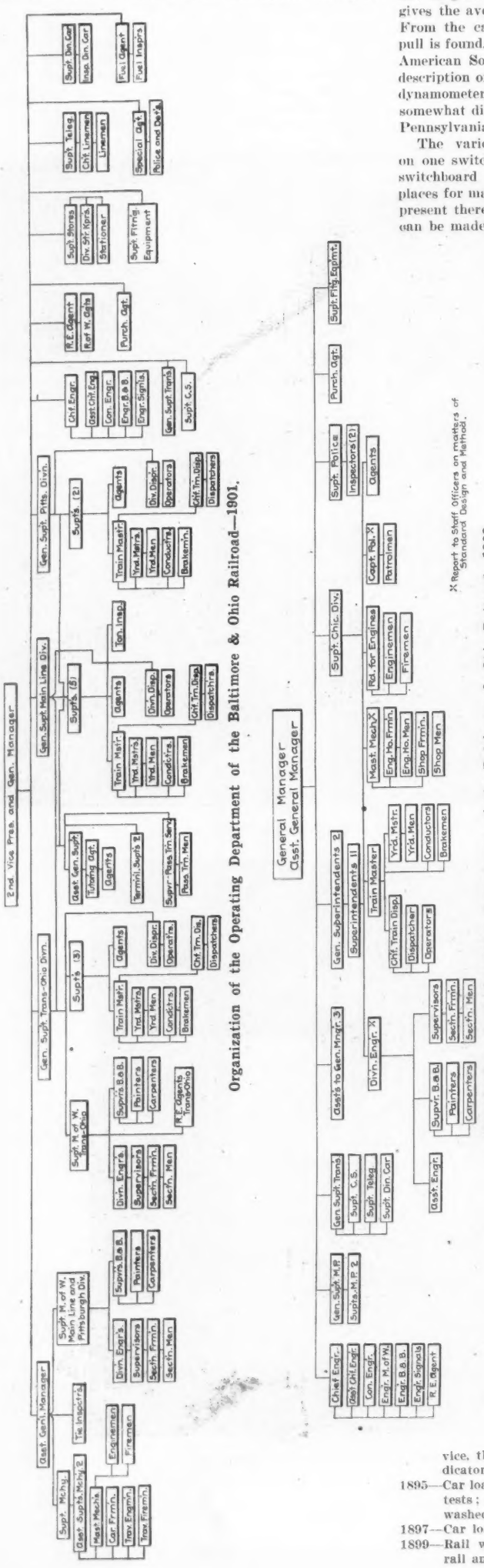
1895—Car loaned to Denver & Rio Grande R. R. Rail washer tests; resistance of cars with sand on rail and sand washed off.

1897—Car loaned to Chicago & North Western R. R.

1899—Rail washer tests: resistance of cars with sand on rail and sand washed off.

1900—Train rating tests, Creston Division, C., B. & Q. R. R. Train resistance as affected by length of train, empty and loaded cars. Tonnage rates equalized for length of train, Galesburg to Mendota, Ill. Passenger train resistance; variation with increase of speed; fast mail tests. Freight train resistance; side bearings and center plates lubricated and not lubricated. Narrow vs. wide fire-boxes; gas analyses.

1901—Curve resistance tests at West Alton, Mo. Freight train resistance; side bearings and center plates lubricated and not lubricated. Compound vs. simple engines; freight and passenger service. Cylinder and boiler performance, mechanical efficiency and gas analyses.



Organization of the Operating Department of the Baltimore & Ohio Railroad—1902.

X Report to Staff Officers on matters of Standard Design and Method.

Report of the Congressional Committee on the Metric System.

The Report of the Committee on Coinage, Weights and Measures of the House of Representatives was presented to the House April 21. A few of the points made in the report are summarized below:

Briefly the advantages of the metric system are its decimal character throughout, the simple relations between the units making it possible to derive all others from the unit of length; its elasticity (being equally convenient for the measurement of the largest or smallest objects), the ease with which it is learned and remembered; the saving of time and the increased accuracy in computations. But its chief value now is its international character, since those in position to know believe that the world must soon come to an international system of weights and measures, and there is not the slightest possibility of our system, or any modification of it becoming universal. If the formulas and other data used in manufacturing and engineering were universally expressed in the metric system, the growth and dissemination of knowledge would be promoted throughout the entire world. Estimates by the Department of Education show that the work of at least two-thirds of a year in the life of every child would be saved by the use of the metric arithmetic. The British Parliamentary committee in charge of a similar investigation estimated the saving at one year. For the 15,000,000 school children being educated in the United States at a public cost of not less than $200,000,000 a year, the waste is enormous. In the lifetime of a single generation nearly $1,000,000,000 and 80,000,000 school years are spent in teaching a system in harmony with that of no other nation. Educators in the United States, Great Britain and Continental Europe state that the metric system and its application may be learned in one-tenth the time required for gaining equal facility in the use of the English system.

This measure does not contemplate any change in existing technical standards, such as screw threads, wire gages, lumber measures, etc., except as manufacturers and others find it to their interest to make the change. Any change in the standards used in manufacturing, no matter how perfect the new system or how beneficial the change, must be carefully and judiciously made. In almost all kinds of manufactured products, a change would involve some inconvenience and very serious if suddenly brought about, but the expense of gradually modifying existing plants or machinery would be slight. In many cases no change or expense would be necessary and the benefits to be derived from a convenient universal standard would far more than compensate for the temporary expense and confusion. Many associations of merchants and manufacturers, both in the United States and Great Britain, have urged the adoption of the metric system on account of its international character and its superiority over the present system.

In commerce the use of our present system involves great loss of time and places our merchants at a disadvantage in dealing with countries using the metric system, more than 60 per cent. of our commerce now being carried on with countries using that system. Mr. Theodore C. Search, President of the National Manufacturers' Association, is quoted at length as favoring the change which he says it is entirely possible to accomplish gradually and without loss or injury to any industrial interests.

In ordinary trade the long, short and gross tons, the barrels of different values, the discarding of the inch in some technical lines and of the foot by others are a few of the instances where a uniform system would prove to be elastic enough for all purposes.

In 1866 Congress legalized the metric system and from that time it has been growing in favor and in practical use. It is now used by about two-thirds of the people of the world. Russia, Great Britain and the United States are the only non-metric countries and Russia has gone far in the direction of its adoption. In both Great Britain and the United States it has been legal for some time, and in England over 300 members of Parliament have expressed their willingness to vote to make the use of the metric system compulsory.

In conclusion the committee earnestly recommends the passage of the bill and says: "Your committee believe the time has come for the gradual retirement of our confusing, illogical, irrational system and the substitution of something better. The first step should be the introduction of the metric system of weights and measures into the Departments of the Government. The use of these weights and measures will simplify their work. It will familiarize the people with them and encourage their application to the common affairs of life. Your commit-

tee have no doubt that the benefits to be derived will far more than compensate for such inconvenience and expense as may be involved in the change."

Electricity in Cement Works.

The first cement plant in Canada to be operated by electric power is that of the National Portland Cement Company at Durham, Ontario. All of the cement making machinery in this plant will be driven by induction motors supplied with current by two Westinghouse 450 K. W., three-phase alternators. These machines are of the engine type with revolving fields and run at 125 r.p.m., 3,000 alternations and 600 volts. Two exciting units are provided, one consisting of a 62½ K. W., 125 volt, engine-type, D. C. generator, direct connected to an automatic engine, and the other of a 56½ K. W. machine coupled to an induction motor. The output of the exciters will be used not only for exciting the fields of the A. C. generators, but also for arc and incandescent lighting throughout the works and grounds.

Considerations Involved in the Determination of Grades and Alignment.*

The ideal line for a railroad is straight between termini, and level throughout. With termini fixed at unequal elevations, the ideal line becomes a line straight and of uniform grade between termini. Again with traffic unequal in the two directions, the ideal line would be one not level but with grade uniform between termini, and so balanced for the unequal traffic that a locomotive would continually work at full capacity in either direction.

Whenever deviation from the ideal line seems desirable, such should be made haphazard, only so far as economy dictates. The elements entering into the consideration of the economy are: First, first cost; second, cost of operating; third, gross earnings.

Let i = interest on cost of construction.
c = cost of operating.
e = gross earnings.
p = profit.
then $e - (i + c) = p$.

This simple equation indicates that it is not enough that the interest on cost of construction and the cost of operating on a certain line A, shall together form a minimum as compared with an alternate line B. The reasonable earnings often form a controlling element. While $(i + c)$ may be larger on line B, yet if e is also larger by a still greater amount, then B is the preferable line, as the formula shows. Furthermore, in a case where there is no difference in earnings on alternate lines, the requisite for economy then is, that the sum of i and c shall be a minimum. It is proper that i should be increased so far as is necessary, if only c be thereby decreased by a greater amount. Similarly c may be increased if thereby i shall be decreased by a greater amount.

It is evident that on a line where there are few trains, a moderate increase in the length and curvature of a line or an increase in its grades can probably increase c by only a small amount, so that a moderate saving in cost of construction will justify such a change. On the contrary, where the number of trains is large, the increased cost of operating a train or a ton on the inferior line will be multiplied many times, and the increase in c will be large, and a large saving in cost of construction will be necessary to justify the adoption of the longer and more crooked line, or the line with heavy grades.

An increase in distance, curvature, or rise and fall adds somewhat to the cost of running each train, but has no effect on the number of trains for a given traffic. An increase, however, in the rate of the limiting grade or limiting curve increases the resistance to be overcome, making necessary a shorter train behind any given engine, and therefore a greater number of trains for a given traffic, and generally each of these must be hauled over an entire operating division.

It is obvious, therefore, that the differences in grade necessary to be considered are much more powerful in their effect upon the cost of operating than are changes in distance, while curvature and rise and fall are generally far less important, in view of the amounts in which they are involved. Curves, if used so as to have a limiting effect, are of primary importance also, but the better practice does not so use them at present.

Limiting Grade.—Considering the question of grade with reference to economy, the steepest actual grade to be operated by a single engine may be called the maximum grade. It is not, however, always the grade which limits the weight or length of train, for several reasons: First—The limiting grade is a virtual grade, and this may be different from the actual grade, due to a difference in velocity between the bottom and the top of the grade. Secondly—The steepest actual grade may be worked by a helper engine, and so fail to be the limiting grade on the basis of equivalent helper grades. Thirdly—Variations in the load over different parts of the division may cause some grade other than the steepest to become the real limiting grade, on the basis of equivalent grades for unequal traffic. This may be true not only as to grades in opposite directions, but also as to those in the same direction.

*An extract from the report of the Committee on Roadway of the American Railway Engineering and Maintenance of Way Association.

Virtual Grades.—Where a train passes over a grade at varying speeds, the virtual grade becomes a curved line. This results from the fact that train resistance and the power of the locomotive both vary with the speed. While this is true, virtual grades can better be understood if their consideration is first taken up on a basis of straight lines, such grade lines serving as measures of resistance. While train resistance is usually stated in the form of pounds per ton, it is frequently and conveniently expressed in the form of grade, and, as is well known, if the rate of grade in feet per 100 be multiplied by 20 the result is the equivalent number of pounds per ton.

When a locomotive is hauling a load, the pull it exerts is frequently greater than that necessary to overcome the ordinary train resistances, even with curve and grade resistances added. The surplus pull, when there is any, acts on the train and accomplishes work whose equivalent is found in the increased energy of the train, and this may be measured by the increase in velocity. When the pull of the locomotive is less than what is necessary to overcome ordinary train resistances with curve and grade resistance added, there is a deficit in the amount of work done compared with what is required; this deficit is practically the same as a retarding force which accomplishes work, whose equivalent is supplied by drawing on the energy stored in the train; the loss of energy is measured by the loss of velocity resulting. A train starting at 25 miles an hour at the bottom of a hill and passing the summit at seven miles an hour will require less pull to haul it than if a uniform speed be maintained, as is well known.

Table 1, showing velocity heads, has been calculated anew by the well-known formula $H = 0.0355\ V^2$. This value H we may call the "velocity head." [The table is not reprinted here.—Editor.]

The actual profile is a matter of location and construction; the virtual profile introduces the element of operating; the latter depends in part on the actual profile, and in part upon the speeds at which certain points are passed. At any station or point on the actual profile where the speed is specified, if the velocity head due to that speed be added to the actual height, it will give a point to be known as the virtual height at this station. The lines joining a series of points marking the virtual heights thus found show the virtual grades, and the profile thus constructed may be called the virtual profile.

The inclination of the line of virtual grade at any point is the true measure of the resistance which the locomotive must overcome as grade resistance. It must overcome this in addition to the ordinary train resistance, as well as the curve resistance unless compensation for curvature has been used. A few examples may be of advantage.

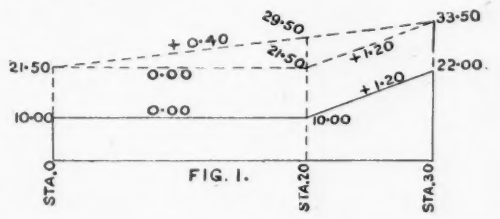


FIG. 1.

In Fig. 1 a train is to pass over the profile at a uniform speed of 18 miles per hour. The velocity head for 18 miles is 11.50. The virtual height at Sta. 0 will be 21.50, at Sta. 20, 21.50, and at Sta. 30, 33.50. The virtual grades will be straight and the same in rate as the actual grades. The engine need overcome from Sta. 0 to 20 nothing more than the ordinary train resistances (if on tangent). From 20 to 30 it must, in addition to these, overcome the resistance of a + 1.20 grade (24 lbs. per ton).

It may be required, however, that the engine shall exert a uniform pull, passing both Stations 0 and 30 at 18 miles per hour. Under this operating requirement, the average grade resistance to be overcome on the virtual grade will be $\frac{33.50 - 21.50}{30} = + 0.40$ (8 lbs. per ton). The train will gain in speed from Sta. 0 to 20, because the engine exerts on a level the pull necessary for a + 0.40 grade. From Sta. 20 to 30, the pull suitable for a + 0.40 grade is unequal to overcoming the actual + 1.20 grade; the energy of the train is drawn upon, the speed steadily decreases and finally becomes 18 miles at Sta. 30. Assuming the virtual grade to be a straight line, the elevation of the virtual above the actual grade at Sta. 20 will be 29.50 — 10.00 = 19.50 ft., which corresponds to a speed of about 23 $^{4}/_{10}$ miles, and this is the speed the train would have at Sta. 20. Strictly, the virtual grade should be a curved line, due to train resistance varying, and the speed would then be slightly different from that given.

Again in Fig. 2 we may know (from experience or experiment, or from computations) that the engine in

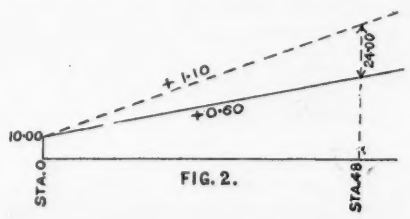


FIG. 2.

starting from rest and acquiring a speed of 26 miles per hour can exert on the average between speeds of 0 and 26 miles per hour a pull just sufficient to overcome a grade of + 1.10, on a tangent, in addition to ordinary train resistance. How far must the train run before the speed of 26 miles shall be secured? Evidently to the station where the distance between the + 1.10 and the + 0.60 grades will be 24.00 ft. (the velocity head for 26 miles) or $\frac{24.00}{1.10 - 0.60}$ = Station 48.

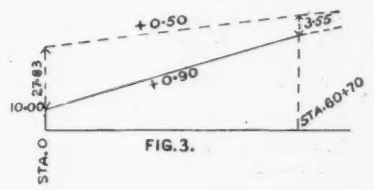


FIG. 3.

Similarly in Fig. 3. An engine can haul its train up a grade of + 0.50 when the speed varies from 28 to 10 miles per hour; it is expected to pass Sta. 0 at 28 miles per hour. At what station on this profile will the speed (gradually reducing) become 10 miles per hour? The velocity head at Sta. 0 (due to 28 miles) will be 27.83, and for 10 miles 3.55. The speed of 10 miles will be reached when the + 0.50 and the + 0.90 grades are 3.55 ft. apart or at a distance $\frac{27.83 - 3.55}{0.90 - 0.50}$ or at Sta. 60 + 70. If it is thought necessary to maintain further a speed of at least 10 miles per hour to avoid risk of stopping, it will follow that the grade beyond Sta. 60 + 70 cannot be as high as + 0.90, but must be reduced to that grade at which the engine can haul its train at 10 miles per hour. This will really be somewhat greater than + 0.50, since the engine at the uniform speed of 10 miles can pull its train up a steeper grade than the average grade for speeds varying from 28 to 10 miles.

A momentum grade may be defined as a grade operated in such a way that surplus energy stored in a train is drawn upon to allow the train to be hauled up this grade, with less resistance to be overcome by the pull of the engine, than would be necessary if uniform speed were maintained. The common case of momentum grades is that where the train passes the foot of a steep grade at comparatively high speed, and is allowed to pass the summit at low speed. The practical problem for the engineer engaged in location or construction is generally to determine either (*a*) how far a steep actual grade can be continued and yet allow a required virtual grade to be maintained, (as considered with Fig. 3) or, where an actual grade is under consideration, to determine (*b*) what the virtual grade will really be under prescribed conditions of operating (following the method used in Fig. 1), and also in this connection often to find (*c*) the speed which it is possible to acquire at the foot of a momentum grade (as in Fig. 1, at Sta. 20).

Modern railroad practice has substantially established the fact that momentum grades have their uses and are frequently of great value, but there are definite and well-known important objections to their indiscriminate use, and that they should be adopted as a matter of course ordinarily or wherever opportunity offers, especially in original location, may be seriously questioned.

The advantage of momentum grades is most apparent on short grades, or just where there is the best opportunity generally to reduce the actual grade. It should not be lost sight of that any grade lower than the limiting grade may at any time have value, due to the fact that many trains do not carry the same load throughout an entire division, but take on or set off cars at stations, with the result that any grade lower than the apparent limiting grade of the division may become temporarily, or even permanently, the real limiting grade, due to the greater loads hauled over it, and the lower grade may thus have the effect of increasing the capacity of the entire division. In revision of line, conditions of traffic

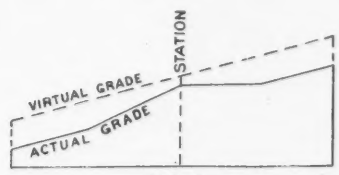


FIG. 4.

and of operating are more definitely settled, and the use of momentum grades can be more intelligently made. It is often a choice between a momentum grade and the alternative of a lower train load over a division, if the grade in question is the real limiting grade of the division.

The proper procedure is for the engineer to note evidence bearing upon the matter from other similar features, to estimate in each case the advantages and disadvantages of the momentum grade, to take into account cost of construction and operating and to consider safety and convenience, and then, with these bearings in view, exercise his best judgment.

The principle of virtual grades finds an interesting application in connection with regular stopping points, such as stations on a railroad where nearly all trains are local. By reference to Fig. 4, it is clear that advantage

results from raising the elevation of the track at such a point. The virtual grade being substantially uniform, the speed is decreased for trains approaching the station from either direction; in starting from the station the grade is also more favorable than the uniform grade, and any desired acceleration is acquired sooner.

At stations where many through trains pass, the only disadvantage would be a diminution of speed in passing the station, which is not altogether disadvantageous on the score of safety.

The subject has thus far been treated on the assumption that a straight line represents the grade up which the engine can haul its train. This is true only when the speed continues uniform. With higher speeds the tractive power of the engine decreases, and in addition, the train resistance increases. The grade up which the engine can haul a given train is less at high speeds than at low speeds, and when the engine starts at a high speed and steadily decreases its speed, the line up which it can haul its train will be curved with the grade flatter at the beginning and steeper as the speed decreases. It is difficult and probably impracticable to directly apply this curved line to an actual profile. It may be possible to substitute for the curved line some straight line whose effect will make it a substantial equivalent for the curved line, but a simple solution in that direction is not an easy matter.

A somewhat different method of solution which is interesting and reasonably satisfactory is in use on the Canadian Pacific Railway, in the form of a diagram by which, in the case of a given engine and train, one can find for each grade the speed the train may acquire (or lose) in given distance, or vice versa the distance necessary to acquire (or to lose) any given speed. The diagrams A and B may be explained as follows:

In Diagram A the curved line A A A shows train resistance in lbs. per ton, for various speeds (being Wellington's curve). The curved line B B B shows the tractive force of the locomotive, reduced to lbs. per ton of train. The train in this case weighs 1,600 tons without the engine and 1,730 tons with the engine. The engine is rated as capable of hauling this train up a grade of 0.60 at a uniform speed of seven miles per hour. This particular type of engine was selected as the most unfavorable in use.

The curved line C C C shows the excess of engine tractive force over train resistance for the above engine and train. The ordinate (above 0 line) to C C C at any speed = the difference in ordinates between lines A A A and B B B. Where the train resistance is in excess of the tractive force of the engine, the line C C C lies below the 0 line of the diagram.

Diagram B is plotted from a series of results, the computation of which may easily be understood by reference to Table II. This table is in simple form, and hardly needs a detailed explanation of method of computation.

Table II.

Speed Miles per Hour.	Vel. Head for Same.	Difference in Vel. Heads.	Surplus Tractive Force of Engine.	Level. —0.5 Grade. +0.7 Gr				
				Same in Grade.	Distance for 1 Mile Increase.	Total Distance.	Distance for 1 Mile Increase.	Total Distance.	Distance for 1 Mile Increase.
0	0.	...	....	....	...	...	...	...	...
1	0.04	0.04	8.0	0.40	0.1	0.1	0.0	0.0	—0.1
2	0.14	0.10	11.8	0.59	0.2	0.2	0.1	0.1	—0.9
3	0.32	0.18	12.5	0.63	0.3	0.6	0.2	0.3	2.6
4	0.57	0.25	12.8	0.64	0.4	1.0	0.2	0.5	—4.2
5	0.89	0.32	12.8	0.64	0.5	1.5	0.3	0.8	—5.3
6	1.28	0.39	12.5	0.63	0.6	2.1	0.3	1.1	—5 6
7	1.74	0.46	12.2	0.61	0.8	2.9	0.4	1.5	—5.1
8	2.27	0.53	11.8	0.59	0.9	3.8	0.5	2.0	—4.8
9	2.88	0.61	11.3	0.57	1.1	4.9	0.6	2.6	—4.7
10	3.55	0.67	10.8	0.54	1.2	6.1	0.6	3.2	—4.2

etc.

For each line representing grades, a complete table of computations is made for the various speeds and from this table the acceleration lines of Diagram B are plotted.

The retardation line for 0.7 might be plotted below the base line, and the same is true also of the lines for 0.8 grade, 0.9, etc. The retardation lines for grades less than 0.6 will never pass through 0, since they become retardation lines only at high speeds. The retardation lines are therefore plotted from speed 40 as a starting point, and the distance necessary for a change of speed from 40 to 39, or the distance necessary to reduce speed from 40 to 39 is therefore plotted at 39 and similarly total distances necessary to reduce speed from 40 to 38, to 37, etc., are plotted at the appropriate points. Table III shows all distances for changes of speed from 0 to 40.

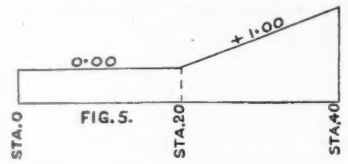


FIG. 5.

The total distances here are computed from 40 as a starting point and the retardation lines are plotted accordingly.

A few examples will illustrate the use of Diagram B. In Fig. 5 the train is assumed to start from Sta. 0 from rest.

What speed will this train acquire at Sta. 20? Follow the level line until it intersects 2,000 ft. This is at speed 16½.

How far on the + 1.00 grade will this train run before its speed will be reduced to seven miles per hour? Find on retardation line + 1.00 the difference between the ordinates at speed 16½ and at speed 7. At 16½ speed the ordinate or distance = 4,150; at 7 distance = 5,850. The answer then is 5,850 — 4,150 =1,700 ft. Beyond this the grade must be reduced to a + 0.6 grade to allow this particular engine (or type) to haul its 1,600 ton train at 7 miles per hour.

In Fig. 6 the train passes Sta. 0 at 25 miles per hour to a — 0.50 grade. What will be the speed at Sta. 20? On a grade of — 0.50 to acquire from rest the speed of 25 miles the train would have to run about 2,800 ft. The train is therefore in the condition of a train which has run down a — 0.50 grade for 2,800 ft. The speed at bottom of grade will be, therefore, that due to this 2,800 ft. + 2,000 ft. of actual grade (Sta. 0 to Sta. 20) or 4,800. This is a speed of about 29.5 miles as shown by the point where the — 0.50 line cuts the diagram at

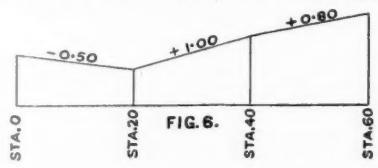


FIG. 6.

4,800 distance. What will be the speed at Sta. 40 on a + 1.00 grade? The distance on a + 1.00 retardation line at 29.5 speed is 1,850; the speed then will be that shown by the intersection of + 1.00 grade with 1,850 + 2,000 = 3,850, or at 18.2 miles. What speed at Sta. 60? Speed 18.2, grade + 0.80 gives 4,850. Add 2,000 ft. to Sta. 60 = 6,850 grade + 0.80 and distance 6,850 gives 10.3 speed.

In like manner the speeds and distances can be traced over any profile. Whenever special requirements as to speed are made, as at stopping places, a fresh start will be made. It may further be considered good practice to depend upon a low speed of 7 miles or 10 miles at important summits or tops of descending grades, even though a somewhat higher speed may appear possible in working with this diagram. Again at low points or sags, a maximum speed of 25 miles or of 30 miles may be specified by the regulations of the railroad.

Any theoretical determination which depends upon both a curve for tractive force of engine and a curve (or straight line) of train resistance, must be subject to the criticism that even if the tractive power of the engine is reliable, yet on any particular railroad the train resistance is likely to be different (often materially so) from that given by any of the well-known formulas or curves.

The series of curves shown in *Engineering News*, Oct. 31, 1901, is even more conclusive evidence on this point. Nearly all of the lines shown in that diagram represent results of actual experiment on some railroad at some time, and have extraordinary range. The work of finding the tractive power of an engine at varying speeds is also carried on at some disadvantage and inconvenience. There are two sources of possible error therefore in determining the surplus tractive force available for grade or for increased speed.

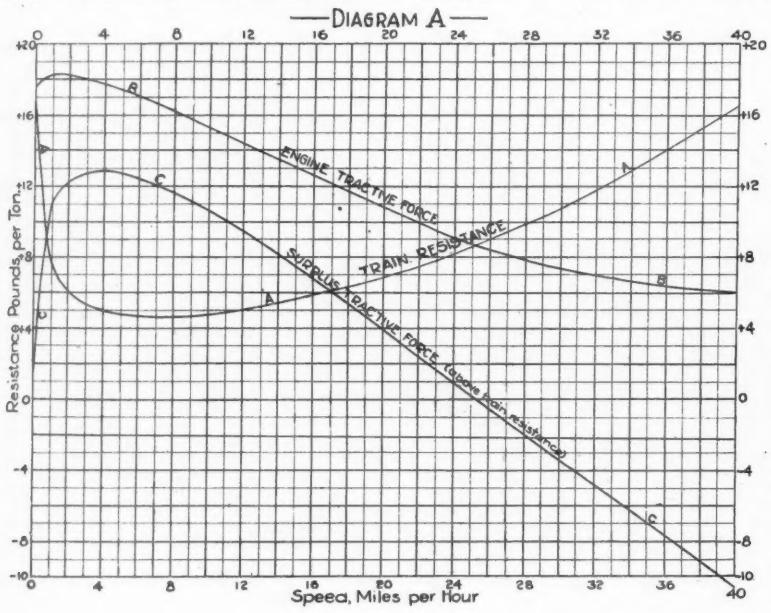
There would apparently be an advantage in point of simplicity in determining this surplus tractive force directly if a convenient means could be found for doing this. Fortunately it can be done by the simple expedient of critically observing velocities continuously during a run, in which the locomotive is handled with the object of securing reasonable uniformity and also thorough effectiveness in tractive force. The velocities must be properly connected with the actual profile of the road. Furthermore, for this purpose, the speeds must be observed with a degree of precision definitely greater than is commonly secured. In fact, it is probable that some special form of speed recorder would be needed for this purpose. The ordinary speed recorders in use would not serve the purpose.

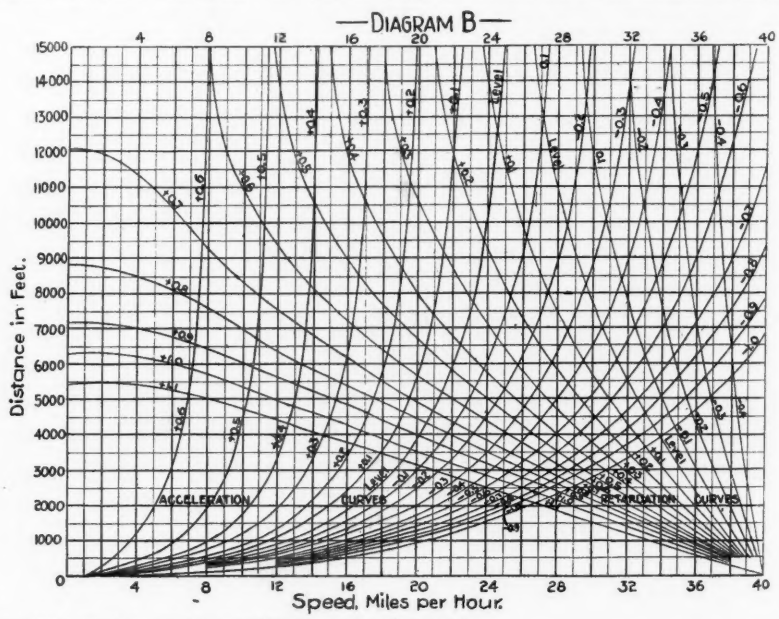
The records of distances and speeds made in such a test would give directly a considerable number of figures necessary for Table II. Dynamometer records would not be essential. They would be very desirable if easily obtained, as sudden and irregular changes in draw-bar pull would thereby be detected and possibly results in certain cases might be thrown out as accidental and not typical; the tests, however, would be in all respects more complete if dynamometer readings were made.

The replies made to the inquiry of this Committee in relation to methods of Tonnage Rating seem to indicate that the practical tests are seldom carried out with the addition of speed records. It reasonably follows that even when Chief Engineers and Engineers of Maintenance of Way are opposed to the use of momentum grades, yet in practically rating the engines, it is probable that in many cases a hill is actually climbed by using a higher speed at bottom and a lower speed at top. It is in any case desirable to know just how the steep grades are overcome, and careful speed records are essential for this purpose. On some railroads careful tests have been made both upon train resistance and upon the tractive power of the locomotive, and tests also as to speed in practical running test, and in such cases the ratings deduced have, in certain cases, at least agreed well with the practical road tests, as might be expected.

Curvature.—In computing from diagrams the speed a train will acquire at the foot of a grade where there are curves, an allowance must be made for the curves decreasing the grade. If curves are not compensated, this grade adjustment will be the total curve height allowance divided by the distance. If compensated, the grade adjustment will be twice as much, since the train will encounter both the curve and the flattening of grade also.

From the result of the Committee's inquiries it would seem that the practice in this country at present favors compensation proportional to degree of curve, and 0.04 per degree represents average practice. The observation of the effect of compensation, however, seems on the whole not to have been critical enough to determine, definitely, whether or not it should be proportional to the degree of curve, and experiment and critical observation is further needed; the effect of curves as shown on a speed recorder capable of recording slight changes in speed is suggested as a desirable method of experimenting.





Diagrams with the Maintenance of Way Association Committee Report—Roadway (Grades and Alignment).

The members of this committee are: W. McNab, Grand Trunk; C. Dougherty, Ill. Cent.; R. C. Barnard, Penna. Lines; H. Baldwin, C., C., C. & St. L.; W. D. Pence, Purdue Univ.; H. J. Slifer, C. & N. W.; C. Frank Allen, Mass. Inst. of Tech.; H. C. Phillips, A., T. & S.F.; I. T. Wilson, P., C. & W.

The American Railway Association.

The spring session of The American Railway Association was held in New York City, April 23 and 24. There were in attendance 134 representatives, representing 102 members. The membership is now 243 roads, operating 199,706 miles.

The Executive Committee suggested the advisability of having a standard cipher code, an open one, to cover all departments of railroad work, with a view of reducing the number of words used in telegraphic correspondence; and a special committee was appointed to take up the question.

The Executive Committee further reported that the American Section of the International Railway Congress had been organized by the election of the President of the Association as its temporary chairman, and the Secretary as its temporary secretary, and that the Executive Committee of the Association had also been selected as the Executive Committee of the Section.

The Standard Code of Train Rules for Double Track, as reported by the Committee on Train Rules, was adopted without amendment. The revised Single Track Rules, containing changes in order to make them harmonize with the Double Track Rules were also adopted.

The Committee on Safety Appliances presented a compilation of the laws in force in nine States in relation to the examination of men for employment in railroad service. (The other States have no laws on this subject.) It also presented a compilation showing the practice as to examinations on the various railroads of applicants for employment and employees in the service. Compilations covering Block Signal Systems and Interlocking Plants in use on railroads, members of the Association, also accompanied the report of the committee. The several compilations were very voluminous and contain much valuable information. The full report of the proceedings of this meeting, to appear in a few weeks, and which will contain this matter, will be a book of 600 pages. The committee also reported the number of freight cars fitted with air-brakes and engines equipped with power brakes in use on Jan. 1, 1902, as follows:

Number of members reporting	147
Freight cars in service	1,436,057
Fitted with air-brakes (76½ per cent.)	1,099,099
Engines in service	36,817
Equipped with power brakes (99.1 per cent.)	36,508
New freight cars under contract or construction to be fitted with air-brakes	73,465
New engines to be equipped with power brakes	2,175

The Committee on Car Service presented a code of per diem rules governing the settlement for the use of freight cars. The report was discussed at great length, after which it was adopted by a vote of 72 in favor and 11 against. The code as adopted will be found below. The roads voting in favor of the adoption of the rules operate 86,003 miles of road and own and control 975,649 freight cars, and the roads voting against the rules operate 15,898 miles of road and own and control 95,592 freight cars. A resolution was adopted that the code be submitted to the railroad companies of the United States, Canada and Mexico for a vote by letter ballot, and that the rules shall go into effect on July 1, if agreed to by a majority of the membership of the American Railway Association, and provided further that such membership shall represent two-thirds of the cars owned and controlled by members of the Association.

The Committee on Statistical Inquiry, in its report, recommended: "That in transportation statistics the ultimate averages of performance should be the ratio between the final results and the motive power used in producing them." This resolution was adopted by the Association.

The Committee on Standard Box Car recommended:

"That 6 in. above any given length shall be rated as even length in feet of whatever length it may approximate. Lengths of over 6 in. shall take the minimum of the next greater length; thus, a length of 38 ft. 6 in. shall be rated as a 38-ft. car; one of a fraction over 38 ft. 6 in. as a 39-ft. car.

"That it is of great importance that all Classification Committees should adjust their scales of increasing and decreasing minimums to the scale recommended by this Association, and the Western Classification Committee ought to reconsider its schedule recently adopted."

These resolutions were adopted.

This committee has requested the Master Car Builders' Association to consider the required external dimensions for the Standard Box Car, and a committee of the M. C. B. Association has decided upon such outside dimensions and submitted them to the different railroads. It is understood that these dimensions are acceptable to the railroads, and that at the June meeting they will, no doubt, be adopted. The committee explains that the width of the side door opening was increased to 6 ft. for convenience in loading, as the adoption of a standard car will naturally prohibit the building of more furniture cars. To enable all classes of commodities to be taken care of by the Standard Car it will be necessary that that car be made to suit all which are provided for in the classification as near as it is possible to do so. If the frame of the car is not sufficiently strong to admit of such an opening, its strength should be increased. At South Bend, Ind., where a large quantity of light and bulky articles originate, and where the number of cars over 36 ft. in length ordered by shippers was from 70 to 92 per cent. of all cars ordered for bulky shipments, the proportion has decreased since the adoption of the new scale to about 46 per cent.

The second resolution reported by this committee was offered in consequence of certain irregularities discovered. The Official Classification Committee has adopted the recommendations of the Association in the increasing minimums for cars over 36 ft. in length, but has not made any decreased minimums for cars under 36 ft. in length. The failure to provide the decreased minimums is working a hardship to railroads owning a large number of 34-ft. cars; unless decreased minimums are made to apply to cars of that length, it will interfere with the general adoption of the standard car. The Western Classification Committee has adopted for cars over 36 ft. in length increasing minimums of 3 per cent. per foot instead of the figures recommended by this Association, which are based upon the actual increase in the capacity approximating 7½ per cent. per foot; and for cars under 36 ft. in length has reduced the minimums at the rate of 3 per cent. per foot instead of at the rate of 2½ per cent. per foot for 35-ft. cars and 5 per cent. for cars 34 ft. or under, as recommended.

The Southern Classification Committee advises that the increase in minimums recommended by the Association will be adopted.

Mr. A. W. Sullivan (Illinois Central) was unanimously re-elected President of the Association; Mr. Geo. W. Stevens (Chesapeake & Ohio) was re-elected First Vice-President, and Mr. C. G. Waldo (Cincinnati, Hamilton & Dayton) was elected Second Vice-President. Mr. J. M. Barr (Seaboard Air Line) was elected a member of the Executive Committee, and Mr. Rollin H. Wilbur (Lehigh Valley) was re-elected a member of that committee. Mr. W. F. Allen was re-elected Secretary and Treasurer.

The Atlantic Coast Line, the Chicago & North Western and the Chicago, Burlington & Quincy were re-elected members of the Committee on Train Rules. Mr. H. W. Ashley (Ann Arbor), Mr. Geo. K. Lowell (Chicago, Indianapolis & Louisville) and Mr. W. A. Gardner (Chicago & North Western) were re-elected members of the Committee on Nominations.

The chairman of the special committee on cipher code is Mr. C. E. McKim, Superintendent of Telegraph, of the Pennsylvania Lines West of Pittsburgh.

Detroit was selected as the place for the next meeting, which will be held on Oct. 22, 1902.

PER DIEM RULES GOVERNING SETTLEMENT FOR THE USE OF FREIGHT CARS.

Definitions.

Home car.—A car on the road to which it belongs.

Foreign car.—A car on a road to which it does not belong.

Private car.—A car having other than railroad ownership.

Home.—A location where a car is in the hands of its owner.

Home road.—The road which owns a car, or upon which the home of a private car is located.

Home route.—The line of intermediate roads over which a foreign car was moved from home.

Home junction.—A junction with the home road.

Home route junction.—A junction on the home route.

Switching service.—The movement of a car at a charge [usually arbitrary] for the service rendered; the road performing such service not participating in the freight rate.

Rules.

1. The rate for the use of freight cars shall be 20 cents per car per day, which shall be paid for every calendar day, and shall be known as the per diem rate.

2. Days shall be reckoned by subtracting the date of receipt from the date of delivery.

A road which receives and delivers a car on the same day shall not pay the per diem for that day.

3. A road shall have the right to demand the return of its car after it has been 20 days consecutively on any road. If the car is held by that road more than 10 days after the date of such notice, making 30 days in all, thereafter a penalty rate of 80 cents per day in addition to the per diem rate shall be paid by such road for the further use of that car.

4. All railroads, including ferry lines, shall be responsible to the car owner for amounts accruing for the use of a car at the established rates, whether such car is in the road service or switching service, until the car has been delivered to the owner or to another road.

5. An arbitrary amount for each car in switching service may be reclaimed by the switching line from the road for which the service was performed. This amount shall be based upon the average number of days actually required, and determined by the roads directly interested for each local territory.

6. In case a road delivers an empty foreign car without the consent of the owner to a road which does not pay per diem; or if a road permits the loading or reconsigning of a foreign car without the consent of the owner to such a road, it shall be responsible to the owner for the payment of an amount equal to the per diem accruing on the car while on such road.

7. When a car has been destroyed or so damaged as to require an appraisement under the Master Car Builders' Rules, the per diem charge will cease from the date of notice to owner.

8. When a car is detained awaiting the receipt of repair material from its owner, the per diem charge will cease from the date the necessary material is ordered from the owner until the date when it is received by the road holding the car.

9. The interchange reports shall close at midnight and shall include all cars exchanged upon the date named unless otherwise noted thereon. The reports must be sent to the car record office on each day whether cars are exchanged or not. In cases where there are different standards of time at junction points the earlier time shall be used.

The interchange reports to the car record office from junction points must be signed by the agents or other authorized representatives of both roads on the prescribed form, the receipt of cars delivered being thereby acknowledged. The time of delivery of cars upon interchange tracks of connecting lines shall, prima facie, be the time given by the delivering road.

10. The junction report for each day will be made to car owners on the prescribed form as promptly as possible after the receipt of the interchange report for that day.

11. Within 30 days after the end of each calendar month car owners shall be furnished with a per diem report for that month, on the prescribed form, showing the number of days each car has been in service upon the road making the report. In computing per diem the day of receipt should be disregarded and payment made for day of delivery.

12. The settlement of amounts accruing for the use of cars shall be made monthly without regard to reclaims pending.

13. When reclaims are made for allowances on account of special conditions they must be made by the designated transportation officer of the road which pays the per diem to the designated transportation officer of the road from which the allowance is reclaimed.

14. When a road refuses or fails to promptly receive from a connection cars upon which it has laid no embargo, it shall be responsible to the connection for the per diem on cars so held for delivery, including the per diem on the home cars of such connection. If such refusal or failure to receive shall continue for more than three days, the delinquent line shall thereafter in addition be responsible for the per diem on all cars in transit which are thus held back for delivery. It shall be the duty of a connection intending to reclaim such per diem allowance to notify the delinquent line daily of the total number of cars so held for it.

15. When a road gives notice to a connection that for any reason it cannot accept cars in any specified traffic, thereby instituting an embargo, it should receive cars already loaded with such traffic at the time such notice is issued. If it does not receive such cars the road holding them may reclaim per diem from the road placing the embargo for the number of days such cars are held not exceeding the duration of the embargo.

After the date of the notice a road must not load or reconsign cars in such traffic to the road issuing the notice. All such notices must be given by telegraph, by the embargoing road, to its immediate connection and by it transmitted as may be necessary.

16. These rules shall not apply to private cars.

17. To interpret these rules and to settle disputes arising under them an arbitration committee of five members shall be appointed by the committee on car service. Three members of the arbitration committee shall be a quorum.

In case any question or dispute arises under these rules it may be submitted to the arbitration committee through the Secretary of the Association in abstract. The abstracts shall briefly set forth the points at issue and each party's interpretation of the rules upon which its claim is based.

The arbitration committee shall base its decisions upon the rules and the abstract submitted, and its decision shall be final. Should one of the parties refuse to furnish the necessary information, the arbitration committee shall use its judgment as to whether it can properly decide. All decisions shall be reported to the association through the committee on car service.

In case a question shall arise not covered by the rules the roads disagreeing may by mutual consent submit such questions to the arbitration committee.

The committee on car service may appoint a secretary for the arbitration committee, who shall be paid by the association. The other expenses of the arbitration committee shall be divided equally between each of the parties to the dispute and the association. The expenses shall be first paid by the association and then billed to the parties concerned by the treasurer of the association.

The Committee says: "The Committee fully understood that what the Association desired was a plan that would be fair alike to the borrowers and lenders of cars, a plan that would give correct car accounts, without any sacrifice of simplicity, and further a system that would move cars without interfering with legitimate and established methods of doing business. One hundred and fifty-five answers were received to circular 421. Of these 111 have expressed themselves in favor of per diem, and these roads control 86.3 per cent. of the cars concerned. Twenty-nine roads were non-committal and only 15 against per diem.

"The per diem system may work an injustice on terminal roads, belt lines and railroads with a short freight haul which provide a terminal. It will frequently take a day to switch a car from the terminal yard to the point of loading or unloading, and it is evident that unless some special provision is made for switching roads, any per diem plan under present traffic conditions would work a hardship on the switching roads. It was proposed that terminal roads should be allowed to hold cars a certain number of days free. This might work very well for cars of connecting railroads, but it would work an injustice where cars of third parties are concerned, and such an arrangement would largely remove the incentive for prompt movement of cars by the switching lines. After careful consideration the Committee proposes that when the switching road has paid the regular per diem to the car owner, it may reclaim from the road for which the switching was done an arbitrary sum per car, the amount of which shall be settled for each locality by the railroads interested. Then the switching lines will have exactly the same incentive for prompt movement that through lines have, as they will only pay per diem on the number of days they hold the cars, while they may reclaim at the end of the month the regular arbitrary amount for each car handled. It is evident that the proper allowance for switched cars will differ greatly in different localities.

"In Rule 14 a mild penalty is proposed for cases where on account of local trouble one railroad cannot receive cars, and a more severe penalty where the trouble continues for more than three days, while Rule 15 provides a plan under which roads can largely relieve themselves and their connections by giving proper notice that they cannot handle designated traffic.

"Fears are expressed that the accounting difficulties may be considerable, but the Committee presents the rules covering the accounting features with great confidence, as they are based on experience gained in the per diem experiment of 1888, where after trial of other systems, it was proved that this general plan worked correctly and without friction. It was to secure simplicity in ac-

counting that Rule 2 is proposed as it stands. Rule 11, covering the monthly per diem report, is intended to provide exact accountability without the sacrifice of simplicity. It is especially to be noted that under the rules proposed, the per diem charge will be uniformly reported and paid every day a car is away from home, and the adjustments are to be made subsequently by a system of reclaims handled between the designated transportation officers of the roads concerned. Such reclaims should of course be made in cases where cars are stored in advance for traffic which is expected to develop, and it is thought that under the proposed plan such holding of cars will seldom take place without the consent of the owner. In cases where foreign cars are held a long time at the seaboard in export trade with the consent of the owner, the holding road can be relieved through the reclaim system.

"The question of the proper rate has been difficult to settle. On the one hand, there is no doubt that under the present system a very small average amount is paid per day for the use of freight cars; on the other hand, the amounts necessary to keep cars in repair and pay interest on investment therein are constantly increasing. The difference between the figures is so marked that very naturally the views of the car owners and the car borrowers differ extremely. The rate of 20 cents per day is presented, therefore, as a compromise, but also as a figure which should provide a proper incentive for the return of foreign cars, and at the same time approach the expense of interest, depreciation and repairs of equipment.

"As 20 cents is so much less than the earning power of cars in seasons of scarcity, it seemed necessary to provide a penalty rate.

"It is possible that we ought to have proposed a penalty for all diversions of foreign cars from home routes, but it was thought best to cover only cases where cars are diverted to a railroad which has not signed the per diem agreement. It is quite possible that a more general diversion rule may be found necessary.

"It will be noticed that these per diem rules do not apply to private cars. The private car question is not a simple one, as it involves many considerations of interest to the railroads as well as to the owners of the cars. Many roads have occasion to use refrigerator cars in large numbers for a short season each year, and during the rest of the year have no use for such equipment. It would be manifestly impracticable for roads so situated to acquire ownership in such cars. In other cases, roads originate traffic requiring cars of special construction, the destination of which is throughout a wide territory beyond the originating line. To provide the equipment requisite for the care of such traffic, would, in many instances, be an unbearable burden for an individual road. Many roads have in such circumstances found the use of private cars on a mileage basis to be of advantage, and are not in favor of a disturbance of such relation until the matter has been made the subject of special investigation by your Committee.

"These rules will improve the movement of our cars on foreign railroads; they will make the compensation therefor in some degree commensurate to their cost, and there will be that certainty and security in car accounts which we are so careful to preserve in all other accounts. The rules are, however, largely new and untried. In order to give impartial interpretation an Arbitration Committee should be appointed. The Committee on Car Service purposes to undertake this burden for the present, with the assistance of a paid secretary.

"The adoption of these rules will lessen the delay to cars on foreign railroads, but not until certain improvements are introduced. In 1888 the defection of certain railroads put a burden on certain others and caused further defections, which led to the failure of the experiment. In order to prevent such an occurrence the Committee will ask the association to arrange that the roads assenting to the per diem rules shall agree with each other so to do, and shall send their signatures to the Secretary of the Association, signifying their acceptance of the rules for the term of one year. . . . No code of rules can be a finality. The Committee desires the help of the Association in improving these rules, and thanks the Association for the opportunity it has had of leading the way, if only for a space, in one of the great railroad movements tending toward efficiency, economy and honesty."

The Per Diem Problem on the New Haven Road.

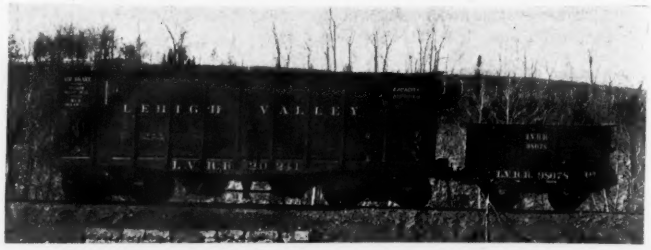
The report of the Car Service Committee of the American Railway Association, which is given nearly in full in another column, is accompanied by the letters of a large number of roads giving, from their respective points of view, statements concerning conditions which will have to be met in abolishing the mileage basis of settlement for freight car hire. The statements of two roads were given in the *Railroad Gazette* of April 18, page 279. The statement of the New York, New Haven & Hartford, one of the roads on which the difficulties of the problem will be most serious, is given below. As in the case of the other two roads, the subject is treated under the two heads of (1) difficulties and (2) remedies.

Difficulties.—(a) Any distributing road, but particularly a New England terminal road, will be to a very great disadvantage over the originating road or the roads intermediate between the two. There are various conditions which tend to retard the unloading of freight on distributing railroads. Almost all bulk stuff takes longer to unload than to load. (b) Export Freight. The movement of this across the water depends upon the market in Europe. It not infrequently happens that there is no demand there for grain, and either the vessels won't take it or the price is such that the owners of the grain will not allow it to be forwarded from seaport, and it consequently remains, sometimes indefinitely, on side-tracks of terminal railroads. Originating and carrying roads often push forward freight for export regardless of markets and compel the terminal road to hold it. This for the purpose of getting the receipts for the freight promptly into their treasuries. A very large part of the grain, flour and hay trade of New England is done on the "hold for order principle;" that is, a few firms, who have a good deal of capital, buy such commodities in large quantities and sell it out in single carlots and, in order to supply the small trade promptly, the "hold for order principle" was established 20 years ago. The general rule is to allow four days without demurrage upon cars loaded with this stuff at the points where it is held for orders. It sometimes takes 24 or 48 hours to get the cars out, when ordered forward, from among the large number of cars that are held, and that adds further to the time; and then when its gets to destination we have, generally by law, to allow four days for unloading. I don't mean by this that it always takes four days to unload, but if the ultimate consignee demands it we have to give it to him. It would upset all the commercial conditions in New England to change the plan, as the small dealers cannot buy direct. (c) The bulk of the cotton that is sent to the New England mills is shipped in about four months in the year. The cotton industries of New England have a great deal to contend against in competition with such industries in other parts of the country, by reason of being so far from the source of supplies and, consequently have to pay very much greater freight rates than elsewhere. The result of this has been that they have failed to provide themselves with adequate storage facilities in order to keep down the cost of the product. Some seasons they buy cotton in very much greater quantities than they do in others, on account of the price. It all comes in in a very few weeks, and it is impossible to get it unloaded unless the mills can provide themselves with very much larger storage facilities than they need most all the time, or the railroad companies do it. Competition among carrying roads west of us for this class of freight is very strong, and they, in some way, furnish the cars, either their own or those of their connections for it, and it is all dumped upon the distributing roads in a very short space of time. (d) A certain amount of time always has to be allowed for loading cars. In the State of Connecticut we are compelled by law to allow four days, and we cannot consistently, for commercial reasons, allow a less time to the shippers who are immediately across the State border; in fact, we have to allow it on the whole line. This is also the law in Rhode Island, New Hampshire and Vermont. So far as the New York, New Haven & Hartford is concerned, the hauls are very short, but the time necessarily taken to get the stuff to destination after receiving it from a foreign line is often as great, if not greater, than the intermediate long lines consume in taking it over three or four times the distance that we haul it. So far as this railroad is concerned, and the same might be said to apply to all New England roads, if we should so increase our equipment that we could supply cars enough to the roads west of us to equalize the mileage, we would have them on our hands idle most all the time. The only time the Western roads would take them would be when there was a great shortage of cars, and even then they would not be taken if the roads had not the motive power to handle them. Just so long as it is possible for the roads west of us to supply the cars into which to load the freight, they will not take our cars and haul them to the point of origin of the freight when they have enough of their own for that purpose, as it would entail a double empty haul. Any per diem charge which is not coupled with an agreement between the railroads to take each others' cars in order to equalize the mileage or the per diem use would be manifestly unfair, and no agreement can last if it is not fair. A great deal of the freight that comes into New England will not stand transfer, whether on account of its character or on account of the short distance it is to be hauled, which would cause unnecessary delay to the freight. New England is in a position of being an immense yard with outlying side tracks to industries, and every railroad man knows how much more time it takes to unload bulk stuff, delivered on private sidings, than it does to haul it on a straight-away railroad. The average distance hauled on this railroad is only about 80 miles. To carry a car 80 miles and back, including the time of receipt of the car from and return delivery to foreign lines, and the time it takes to unload will occupy fully as much time as to haul it 500 miles on a straight-away railroad at the very lowest estimate, and the revenues derived therefrom are probably not over a third of the amount received for the larger haul, and in the case of a great deal of carload stuff, not so much as that.

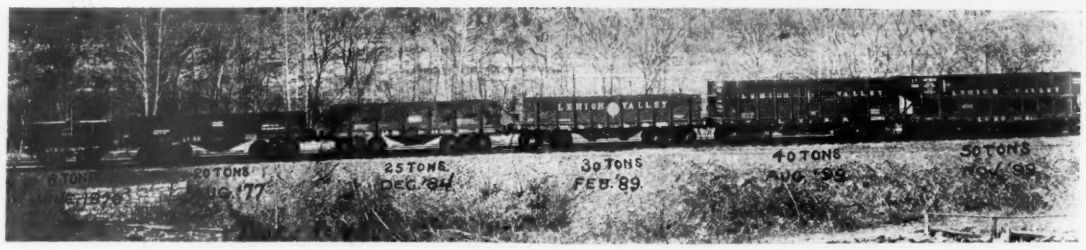
Remedy.—It seems that if a per diem is established a regulation should be made which will relieve the distributing railroad of such per diem charge for a certain length of time, at least on freight held for orders and for export, also on cars containing such commodities as are shipped to the markets for the year's consumption in a very small portion of the year, like cotton, wool and hay; also that they should be relieved of paying a per diem charge for such portion of the time as they are compelled to hold freight by law in excess of that which is generally allowed, namely, 48 hours. Some regulation should be made governing the responsibility for per diem charge on cars delayed at junction points. Under the per diem plan, a distributing road will receive it no faster than the consignees can promptly unload it. This would probably back up to the originating road and create a great confusion commercially. No large concern can do business where they are far from the base of their supplies in this way. It cannot make any calculations upon receiving its freight regularly, i. e., day by day, or often week by week. That the Western connections of distributing railroads should be compelled to take the cars of such railroads, if they are offered, and take them to the originating points for freight which comes to such railroads or pay the cost of transfer. That in all cases where freight is moved in large quantities, in excess of the demand, or the ability to promptly unload, distributing railroads should have the option of receiving it only so fast as it can be reasonably gotten rid of. That in no case should a per diem be charged on cars in shops for repairs from the time when the owner of such car is called upon to furnish material for such repairs, under the Master Car Builders' rules, to the time of receipt of such material. Can the railroads sustain the position of making a much larger charge for demurrage than they charge each other for car service?

In another statement the New Haven road says:

"A great deal of freight is carried for a very small margin of profit. Any considerable charge per diem, over and above what the present method produces, would very soon wipe out any profit from the carrying of a large amount of freight. . . . Cheap transportation is absolutely necessary for the prosperity of the country. A great deal of stuff cannot be used except at very low rates of transportation, and if a burden is put upon the railroads where such stuff is consumed, which will wipe out the profits of such movement, it either compels them not to carry it or to do so at a loss. . . . If any railroad objects to its cars being held for an undue length of time their remedy is in not furnishing cars for that class of freight; and not in putting the burden upon roads that are powerless to protect either themselves or owners of the cars. This might result in a considerable loss of revenue to the road undertaking that plan, but they would sustain that themselves and not compel an innocent party to bear it."



1899. 1863.



The Evolution.

Evolution of the Lehigh Valley Coal Car.

A good idea of what the Lehigh Valley has done in increasing the size and carrying capacity of its coal cars in about 36 years, is had from the photographs shown above and the following particulars.

In the summer of 1863, at the South Easton shop, was built the first six-ton coal car. Its weight was three and one-half tons, and its capacity 12,000 lbs. The next step was in 1877, when 20-ton cars were built,

with a capacity of 40,000 lbs., and an average weight of 20,530 lbs. In 1884 came the 25-ton cars, with a capacity of 50,000 lbs., and weighing about 23,590 lbs. The first 30-ton car was built in May, 1887, with a capacity of 60,000 lbs., and about 27,490 lbs. weight. By the early fall of 1899, the size had increased to 40 tons—the load 80,000 lbs., and the weight about 36,650 lbs., and in November of 1899 were built the 50-ton all-steel cars, with a total capacity of 100,000 lbs. and weighing 37,420 lbs. It will be seen that the car of 1899 has a capacity over eight times greater than that of 1863. The dates on the photographs are those on which the cars shown were built.

The Interstate Commerce Commission's Car-Inspection.

As the reader is aware, the Interstate Commerce Commission employs six or more inspectors who visit freight yards, to examine cars, with a view to finding out the degree of thoroughness with which the railroads of the country comply with the laws in respect to automatic couplers, power brakes, hand-holes, and the height of draw-bars; and during the coming year an increased number of men will be kept in the field. In the last annual report of the Commission, an abstract of which was given in the *Railroad Gazette* of January 31, the result of the work of these inspectors was given, and a summary of this part of the report was given in our abstract. Since then the Commission has issued the full text of this part of the report, and following are extracts from the same, covering points not dealt with in the abstract.

The number of conductors, brakemen, switchmen, flagmen and watchmen, killed in coupling accidents in the year ending June 30, 1901, expressed by the ratio of the number killed to the total number employed, appears to have been less than in the year immediately preceding by about 35 per cent., and the number injured by about 52 per cent. This appears in the following table, which covers 70 per cent. of the operated mileage of the country.

Table No. 1.—Accidents Incurred in Coupling and Uncoupling Cars.

	Employees on 87 roads.		No. of trainmen employed to 1.*	
Year Ending June 30.	Killed.	Injured.	Killed.	Injured.
1898	209	5,433	555	21
1899	196	5,281	592	22
1900	228	3,970	546	31
1901	161	2,082	837	65

*Ratio based on trainmen other than enginemen and firemen, and including switchmen, flagmen and watchmen.

This shows a decrease of 64 fatal casualties per 100,000 employed for the year ending June 30, 1901, as compared with the previous year, a decrease equal to 35 per cent. That this decrease in the number of fatal casualties to employees engaged in coupling and uncoupling cars is in very large measure the result of the operation of the safety appliance act of 1893 (which went into full effect in August, 1900) is not open to serious question. For the month of July, 1901, only four employees were killed while coupling and uncoupling cars. For the last year, which has been fully reported (year ending June 30, 1900), the number of killed in coupling accidents averaged 23½ a month.

Complete statistics for five years are shown in the following table:

Table No. 2.—Accidents Incurred in Coupling and Uncoupling Cars.

	Total number of employees.		No. of trainmen employed to 1.*	
Year Ending June 30.	Killed.	Injured.	Killed.	Injured.
1893	433	11,277	349	13
1897	214	6,283	647	22
1898	279	6,988	518	21
1899	260	6,765	563	22
1900	282	5,229	550	30

*Ratio based on trainmen other than enginemen and firemen, and including switchmen, flagmen and watchmen.

The commission employs six inspectors. During the 12 months, from July 1, 1900, to June 30, 1901, these men examined about 98,600 cars. A table summarizing the results of these inspections is given in the appendix. From this it is found that the inspections for these 12 months, when compared on as fair a basis as is possible with the inspections of the preceding nine months, show a general improvement in the matter of defective cars of about 13 per cent. At the same time it is to be noted that in the number of defects in Class A (couplers and parts of same) there is an increase of about 3½ per cent. This, it is believed, does not indicate increased neglect, but rather is to be explained by the fact that the inspection has gradually been made more comprehensive and thorough. Again, it is known that, during the three months immediately preceding Aug. 1, 1900, the work of equipping cars to conform to the law was at many places carried on under unusual pressure, which no doubt led to some imperfect construction. At the present time the railroads generally make very thorough inspections of the couplers which they buy.

In defects of uncoupling mechanism, which class constitutes nearly two-thirds of all the defects found in connection with couplers, the improvement from the preceding period is 25 per cent. This is a substantial gain, and the accuracy of the figures is confirmed by observation at many places.

Uncoupling attachments have been one of the most troublesome questions in connection with the introduction of vertical plane couplers. A large percentage of the minor accidents to trainmen has occurred while using or trying to use these appliances. The horizontal rod is frequently out of order and the brakeman attempting to use it while the car is in motion has to run alongside of the train, and he neglects his own safety. Many uncoupling hooks are found defective by reason of too short a chain. The inspector sets out to remedy the defect and is liable to put on a chain which is too long, thereby introducing a difficulty of another kind; for too long a chain may make it impossible for the brakeman or switchman to lift the coupling pin without going between the cars.

When preparing the rules for our inspectors a clause was inserted requiring a report to be made of any car of which the brake cylinder or triple valve had not been cleaned within six months. This length of time was decided upon after conference with members of the Master Car Builders' Association, and in the expectation that that association would adopt a similar rule. But the expected action was not taken at the annual convention of the association, and the rule was not adopted; whereupon the inspectors were notified to examine these parts with the understanding that marks showing they had been cleaned within one year should be accepted as satisfactory.

A common defect in couplers is breakage of the knuckle, often due to shocks, which, if the knuckle had been solid, would not have been serious. As the transition period is now passed there is no good reason why solid knuckles should not be generally introduced.

The time saved in yard work by reason of moving the cars faster, due to the use of automatic couplers, and stopping them more quickly by the aid of air-brakes, amounts in many cases to an important advantage. Railroad officers have testified to a large saving in the cost of doing work in yards because of this economy in time. Yards, which were taxed to their utmost capacity by the work required four or five years ago, have been able to accommodate the large increase of traffic in the last few years without additional tracks or switches.

One of the prominent matters which has engaged the attention of the inspectors is the condition of retaining valves. But few railroads have as yet made regular, intelligent and systematic use of retaining valves, and as a result the valves have been very generally neglected. Trainmen do not use them in all cases where they should, and often they are unable to use them if they would, because they are not in working order.

A prolific cause of unsatisfactory air-brake service is found in deficient arrangements at yards for testing the brakes. The approved practice is to have air-supply pipes laid along the tracks in the yards where trains are made up. But, for lack of proper facilities, testing is often left to be attended to after the engine is attached to the train, and imperfect work or neglect is not uncommon. It is gratifying to note that the principal railroads are rapidly equipping their yards with the necessary appliances to do away with this cause of poor service. . . . Every conductor should promptly advise the repair men of all defects found in service. The brakemen should keep their conductor fully advised of the conditions throughout the train. Brakemen can easily detect many irregularities which the inspectors at the yards can discover only by great care and the expenditure of much time. Whenever the air-brakes on a car are cut out, the reason for so doing should be recorded on a card to be attached to the car. These cards are now very generally provided, but are not always systematically used. Improved maintenance of air-brakes, making it possible to use a larger proportion of the air-brake cars in each train, would, it is believed, diminish the annoyance, expense and danger due to the breakage of wheels under the very heavy loads now carried.

The running of trains partially air braked is a practice which is still tolerated everywhere. The balance of economy is, probably, in favor of the running of trains partly air-braked, rather than with no air-brakes, but the duty of doing away with such a dangerous condition must, nevertheless, be obvious to every railroad manager. Trainmen have a duty in this matter; not only a duty to themselves to avoid unnecessary personal danger, but also to their employer to best preserve his property and most effectively use it. Whether to use air-brakes on one-third or two-thirds or nine-tenths or the whole of the cars of a train often depends on the energy, care and good judgment of the men who make up and manage the train; and, of course, these men should work harmoniously together and with an intelligent appreciation of the possible consequences of neglect or indifference on their part.

As a result of the present condition of the air-brakes on the freight cars of the country, of the lack of thorough training and discipline of the men in charge of trains, and the insufficiency of the forces assigned to inspection and repair, some companies, more particularly in the East, are still controlling trains on steep descending grades by the use of hand brakes. This is in disregard of the lessons of the experience of those railroads which have used air-brakes on freight trains for many years in the West and is contrary to the advice of expert air-brake engineers. There is no question that one of the main purposes of the safety-appliance act was to provide for the universal use of continuous power brakes on all trains, and the use of air-brakes on all of the vehicles of every train is necessary for both economy and safety.

Defects of Cars Reported to Interstate Commerce Commission.

	Total, year ending June 30, 1901.	Per cent.
Couplers and Parts.		
Broken coupler body	60	0.25
Broken knuckle	60	.25
Broken knuckle pin	203	.84
Broken locking pin or block	90	.37
Bent locking pin or block	27	.11
Wrong locking pin or block	11	.05
Wrong knuckle pin	295	1.22
Worn locking pin or block	5	.02
Worn couplers or knuckles:		
Couplers	1	...
Knuckles	18	.07
Short guard arm	...	...
Missing parts of coupler:[1]		
Coupler body	6	.02
Knuckle	28	.12
Locking pin or block	40	.17
Knuckle pin	11	.05
Split key from locking pin	1,360	5.61
Trigger	4	.01
Inoperative lock[2]	147	.61
Bent knuckle pin	8	.03
Total	2,374	9.80
Uncoupling Mechanism.		
Broken uncoupling lever	61	0.25
Broken chain	3,599	14.85
Broken end lock	147	.61
Broken inner casting	84	.35
Bent uncoupling lever[3]	913	3.77
Chain too short	178	.73
Chain too long	1,747	7.21
Loose end lock	1,898	7.83
Loose inner casting	2,687	11.08
Wrond end lock	1,032	4.26
Wrong inner casting	12	.05
Uncoupling lever incorrectly applied[4]	2,715	11.20
Uncoupling lever wrong dimensions:		
Long	69	.28
Short	31	.13
Large	12	.05
Small	4	.01
Missing parts of uncoupling mechanism:		
Rods	505	2.08
Chains	47	.19
End locks	75	.31
Inner castings	52	.22
Clevis	...	...
Clevis pin	22	.09
Clevis pin split key	130	.54
Clip	3	.01
Chains kinked	32	.13
Bent end lock	19	.08
Loose clip	7	.03
Broken clevis pin	8	.03
Total	16,089	66.37
Visible Parts of Air-Brakes.		
Defective triple-valve casting	13	0.05
Defective reservoir casting	...	...
Defective cylinder casting	...	...
Defective cut-out cock	1	...
Defective release cock	77	.32
Broken release rod	...	...
Defective angle cock	33	.14
Defective train pipe	141	.58
Loose[5]	...	...
Broken[5]	...	...
Defective cross-over pipe	3	.01
Defective hose	16	.07
Defective hose gasket	19	.08
Defective brake rigging	13	.05
Defective retaining valve	42	.18
Defective retaining-valve pipe	107	.44
Missing parts:		
Hose	100	.41
Angle cock	5	.02
Retaining valve	5	.02
Pipe clamp	2	.01
Release rod	2	.01
No brakes of any kind	2	.01
Air-brakes cut out[6]	1,583	*6.53
Cylinder and triple valve not cleaned in prior 12 months[7]	954	3.94
Date of cleaning cylinder and triple valve not shown	255	1.05
Total	3,373	13.92
Hand Holds.		
Hand holds missing	473	1.95
Hand holds improperly applied	217	.90
Hand holds bent	1,194	4.93
Hand holds broken	27	.11
Hand holds loose	265	1.09
Total	2,176	8.98
Height of Draw-bars.		
Empty cars too high	7	0.03
Empty cars too low	36	.15
Loaded cars too low	30	.12
Loaded cars too high	6	.03
Total	79	.33
Carrier Iron.		
Loose carrier iron	24	0.10
Total	24	.10
Side Steps.		
Bent side sill step	50	0.20
Loose side sill step	65	.27
Broken side sill step	7	.03
Total	122	.50
Grand total	24,237	100

[1] Cars that have been reported defective on account of split key missing from knuckle pin are omitted from this table.
[2] Inoperative for cause unknown.
[3] Includes only those where proper operation is interfered with.
[4] Includes uncoupling-rod handles too close to car body, to end sill, or to truss-rod nut, and uncoupling rod binding on brake staff, or on retaining-valve pipe, and uncoupling rod not adjusted to locking pin.
[5] Included in No. 47, "Defective train pipe."
[6] Cars cut out with no card attached showing cause.
[7] Includes only cars having no stencil marks showing date of cleaning, or having marks showing that they were not cleaned in the 12 months preceding inspection. Cars originally reported on account of not being stenciled as cleaned in the six months preceding inspection are omitted.

The table gives the classification and percentages also for the nine months ending June 30, 1900. The total number of cars inspected in these nine months was 17,669, of which 5,785 were found defective. The total in the 12 months, to June 30, 1901, shown in the foregoing table, was 98,624, of which 19,462 (19.73 per cent.) were found defective.

[*From the Appendix.*]

LETTER FROM MR. G. W. RHODES.

The introduction of automatic couplers and power brakes has been of inestimable value to railroads, and has resulted in greater safety and greater economy in the operation of trains.

These appliances have enabled us to handle our business much more expeditiously, not only while the trains are in transit, but while they are being distributed or

(*Continued on page 330.*)

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The Organization of a Railroad.*

On another page will be found two diagrams showing the organization of the operating department of the Baltimore & Ohio Railroad. One of these is as the organization was in 1901, and the other is as it has now been established. A glance at the diagrams is enough to show that the organization has been materially simplified, and a little study will show that it has been quite radically changed. Indeed, the organization, as it is now, is different in some material respects from any other that we know of. It is a good example of a systematic division organization, such as Mr. Arthur Hale described in the article which appeared in our issue of April 11; but it will be observed that some of the departments have considerable scope, thus, so far as these go, introducing a trace of the department theory. It will be seen, for example, that the General Superintendent of Transportation has taken over the Superintendent of Telegraphs and his dependencies, and the Superintendent of Dining Car Service, besides the Superintendent of Car Service who would ordinarily report to the General Superintendent of Transportation. We have been told that this placing of the Superintendent of Telegraphs is working out well. It will be seen also that the Chief Engineer has taken over a number of officers, who, in a strict division organization, would report up through the Transportation Department.

One important feature of this new Baltimore & Ohio organization is the position of the Assistant General Manager. He is not assigned to some restricted part of the work, but he has powers as extended as those of the General Manager himself. The theory is, that neither the General Manager or the Assistant General Manager, neither one or the other, should be confined to his desk; each should be free to go out on the road and stay there. But while the General Manager, for instance, is away, the Assistant General Manager will handle all of the office work for that department. He will dispose of the routine precisely as if the General Manager himself were there. It is possible that he might not have the experience or the judgment of the General Manager, but this experience and judgment he never will have unless he exercises the responsibilities of a general manager. It is held to be better that a matter should be decided and a decision made, than that it should lie over for the return of the General Manager, even if the decision happens to be wrong. At any rate, the wheels are not blocked. The machine keeps on, and somebody will catch and correct an error that has been made in the General Manager's office.

It will be observed also that there are three Assistants to the General Manager, to whom nobody reports. These three gentlemen are aides-de-camp. They are eyes and ears, and, to a considerable degree, brains for the General Manager, and we suspect in this instance, for the President. They may be assigned to special duty anywhere, and at any time, and may be kept on a job until they finish it without interfering with the work of the organization. Of course, every intelligent railroad president and general manager has felt the great need of such men; but no one before, so far as we know, has had the candor and the courage to frankly create such a position and to put good men into them unblushingly, without pretending that they belong anywhere else. Obviously, the value of these men is largely a personal matter. It depends a good deal upon the sense of the men who use them, and it depends still more, perhaps, upon the capacity of the men themselves. They must be experienced specialists, and yet they should have a broad knowledge of the railroad field.

Concerning the general question as to which is better, the division organization or the department organization, we shall not now enter into a serious discussion of the matter. The reader should look back to Mr. Hale's article (our issue of April 11) for a pretty compact statement of the arguments. On the whole, we agree with Mr. Hale, and have long held, that the division organization is the better one; that it is more likely to breed an efficient staff; that it is more likely to be flexible and that the division is the largest efficient operating unit, but it is not entirely without its dangers. We could name cases where the division organization has bred extravagance and inefficiency, particularly in the mechanical department. After all, the General Manager must know good men when he sees them and must know how to get and keep them, whatever the form of organization. It is an old lesson that human affairs will not go automatically.

*For other examples of organization see the *Railroad Gazette*, April 27, 1900, chart of the Pennsylvania Railroad organization; August 31, 1900, chart of the Erie organization; Dec. 14, 1900, chart of the Lehigh Valley organization; Nov. 9, 1900, description of the organization of the Southern Railway; Sept. 27, 1901, chart of the Illinois Central; Jan. 31, 1902, description of the organization of the North Eastern of England, and April 11, 1902, a general discussion, with diagrams, by Mr. A. Hale.

"Per Diem" in Sight at Last.

The per diem resolution appears to have gone through the American Railway Association meeting with flying colors, and the committee is to be congratulated on the adoption of its report with practically no changes at all. It appears that the Chicago & North Western was not represented at the meeting, so that the New York, New Haven & Hartford was the only prominent member of the minority which appeared to urge its claims. We do not learn, however, that anything was brought out during the long discussion to make the conditions appear in any respect different from what they were as set forth in our issues of April 11 and April 18.

The rate adopted, twenty cents, is far too low, but the adoption of any rate whatever will be a great step; for when the principal roads of the country are lending thousands of cars, as they now are, for an average sum of less than 15 cents per car per day, any improvement, in any direction, is welcome. With the thousands of large cars, more costly than the old ones, now being constantly added to the car supply of the country, a per diem rate which should produce no improvement in the average income of the car owner would really be a losing rate, for the average cost is constantly rising. If the per diem movement should die to-morrow, the need of an increased rate, to correspond with increased cost, would still exist. Twenty cents is therefore a help toward a better return on the investment.

Whether the great step will actually be taken, now depends on the votes which are to be sent to the secretary within the next two months. As the affirmative answers heretofore given, which make up the 86 per cent. reported by the committee, are based on a question with a proviso ("provided a practicable per diem system can be devised"), there is no telling how many weak knees may develop between now and July 1; but the officers of the Association appear to feel no apprehension, and we may therefore safely assume that there is no ground for any.

As will be seen by our report of the meeting, the votes are to be really signatures to a binding contract, extending over one year, so there can be no vacillation such as killed the experiments of 1888 and 1898. That the arbitration committee will be a very important factor in the success of per diem goes without saying. This committee will consist of five of the following nine members of the Car Service Committee:

C. P. Clark, N. Y., N. H. & H.
T. E. Clarke, D., L. & W.
A. Hale, B. & O.
A. J. Hitt, C., R. I. & P.
L. E. Johnson, Norfolk & Western.
A. W. Johnston, N. Y., C. & St. L.
H. L. Magee, Wabash.
M. Trump, Pennsylvania.
J. M. Warner, C. & W. I.

Mr. Hale is chairman of the committee, and presumably will be chairman of the arbitration committee.

Annual Reports.

The General Electric Co.—The tenth annual report of this company, being to January 31, 1902, was issued last week. The profits for the year amounted to $8,598,000; this was after deducting expenditures of $1,131,584 on plant and machinery, and after allowance for depreciation and losses. Dividends and interest paid amounted to nearly $2,000,000. The increase in the value of the stocks and bonds owned was a little over $2,000,000; so the sum of $8,658,000 was added to the surplus account. The First Vice-President, General Griffin, reports total sales as billed to customers of $32,338,000, and profit on sales as $7,084,000. The sales billed out are about $2,000,000 less than orders received. The actual sales in 1895 amounted to $12,540,000; this amount diminished to 1898, and since that it has increased—the gain from 1901 to 1902 having been about three and one-half millions. Among the great orders mentioned especially is 55,000 h.p. in generators for the Niagara Falls Power Co., including three of 10,000 h.p. each. The Manhattan Railway Co. has ordered 1,800 motors (125 h.p. each) for its car equipment. One of the orders was for the equipment of the tramways of Tokyo, which will be the largest electric plant in Asia. Mr. Rice, the Third Vice-President, reports on manufacturing and engineering. In spite of the colossal works of the company already in existence, important additions have been made and are now under way. During the year the company has installed transformers to be operated at 80,000 volts; the highest voltage used before this was 60,000. In conclusion, Mr. Rice says "the original, ingenious and successful work of our engineers commends our admiration."

The patents, franchises and good-will are carried at an even $2,000,000. During the year there was expended on patent account $452,000, but this has all been written off in various ways. The factory plants are carried at $4,000,000, although the total book cost is $11,817,881, the difference having been written off for depreciation in nine years. The stocks and bonds owned are carried at $9,825,008. No re-valuation of these securities had been made for five years, and now a careful valuation has raised this item on the books by $2,057,685. The notes and accounts receivable stand at $11,364,345, very much the greater part of this being accounts receivable. This item has grown something more than $2,000,000 during the year. In addition, there are notes and accounts receivable of 160 debtors, aggregating about one and one-quarter million dollars. These, however, are carried on the books at $160, being one dollar for each debtor. During the year over $24,000 was realized by settlement of this class of accounts.

The Pennsylvania Steel Co.—The first annual report of the Pennsylvania Steel Co. (of New Jersey,) has recently been made public. The corporations in which this company is interested are the Pennsylvania Steel Co. (of Pennsylvania), preferred stock $1,500,000, common stock $5,000,000, all owned by the New Jersey Company; Maryland Steel Co., $1,000,000 capital stock, all owned; Baltimore & Sparrow's Point Railroad Co., $150,000 capital stock, all owned; the Spanish-American Iron Co., $2,400,000 capital stock, all owned; the Juragua Iron Co., $1,395,000 capital, half owned. The company also owns more or less of the bonds of these various corporations. The combined business of these various operating companies for the year 1901 yielded, net, $2,879,000. Income from other sources brought the gross income of the parent company up to $3,202,000. Interest paid was $550,000, and the reserves for depreciation $491,000. The net gain was, therefore, $2,162,000. Out of this the operating companies paid dividends to the amount of $1,150,000 into the treasury of the parent company, which latter company declared a 3½ per cent. dividend on the preferred stock last November, and another dividend at the same rate payable May 1, next. The preferred stock amounts to $16,500,000. On the common no dividends were paid. Among the additions and improvements made by the various corporations, are a frog and switch shop and bridge shops at Steelton, coke ovens and other improvements at Sparrow's Point, and a new line of railroad by the Spanish-American Iron Co.

The first railroad representative heard by the House Committee at Washington was Mr. A. C. Bird, of the Chicago, Milwaukee & St. Paul, who appeared on Tuesday last. He opposed the Corliss-Nelson bill. His argument was largely apologetic, admitting the evils of discriminating rates; but he attacked the proposed measure on two grounds—that it would not give the relief desired and would dangerously increase the powers of the commission. The unsatisfactory character of the Corliss-Nelson bill has led Representative Wanger, a member of the committee, to introduce a new bill. It includes some features of the Corliss-Nelson bill, but has a section permitting the making of traffic agreements. It incorporates some of the suggestions made by Chairman Knapp. Orders made by the commission after due hearing shall become operative within 30 days, or, in case of proceedings for review, shall be operative within 40 days. Orders are reviewable by the Federal Circuit Court for any district through which the road runs. The

Court is empowered, as in the Elkins bill, to suspend the order of the commission pending review. An ultimate appeal lies to the Supreme Court. Any two or more common carriers may fix rates by agreement, and such agreements are to be filed with the commission. Should it appear that any contract results in unreasonable rates or inadequate service the commission may annul that contract after 10 days' notice or may alter it. Violations of the act are subject to a fine of $10,000. The effect of Chairman Knapp's recommendation is seen in Section 4, which provides that things done or omitted by a corporation which, if done or omitted by its officer, would constitute a misdemeanor, are to be visited with the same penalties as if done by any such officer. Wilful failure to file and publish tariffs or to observe such tariffs is to be punishable by a fine of $1,000 to $20,000, and a shipper guilty of accepting discriminating rates is subject to similar penalties. Sections 5 and 6 provide that in all proceedings for the enforcement of the act any one who may be affected by the rate or order may be included as parties; and whenever the commission may have reasonable grounds for believing that the act is being violated it may compel observance of it by proper process, which shall be enforceable against the parties interested in the traffic, as well as against the carrier. On the whole Mr. Wanger's plan, despite some slender "concessions to the railroads," is so extreme that the committee is not likely to receive it favorably. But it affords one more bit of evidence that Congressmen are beginning to take a more lively interest in the railroad problem.

NEW PUBLICATIONS.

The British Railway Position. By George Paish. Reprinted from *The Statist,* with an introduction by Mr. George Gibb, General Manager of the North Eastern Railway. Octavo, 322 pages; index. London: *The Statist,* 1902. Ten shillings.

For a few years past a small group of Englishmen have been trying assiduously to teach their countrymen that British railroad service costs too much to produce; that it costs the consumer too much; that some considerable part of the cost of manufacturing transportation is an unnecessary burden upon the railroad properties; that some considerable part of the charges to shippers for carriage is an unnecessary burden upon the trade and industry of the nation, and that enlightened modifications of the methods of working would add to the returns received by the stockholders and (what is vastly more important) to the wealth of the nation. The charges and specifications that have been made and the remedies that have been proposed we shall not now go into in any detail. Naturally they must have been various and voluminous and complicated, for they have had to do with a vast and complicated subject. The writers have agreed pretty well, however, that the British railroads could be worked much cheaper if freight were hauled in bigger carloads and in bigger train loads; also that British railroad officers would have sooner discovered the weak spots in their management of affairs if they had kept and studied statistics of ton-miles, passenger-miles, train-loads and car-loads.

Doubtless these things are true, within their proper limits, but the discovery is not new or even recent. In 1885 an American engineer, Mr. Edward Bates Dorsey, prepared for the American Society of Civil Engineers a paper entitled "English and American Railroads Compared." This paper was read June 24, 1885, at the annual convention of the society, it received the Norman Gold Medal for that year, and, with a supplementary paper and discussions by other members, it was published by John Wiley & Sons in 1887. The paper attracted a good deal of attention on both sides of the Atlantic and got (and deserved) a good deal of criticism. But in the main Mr. Dorsey was right and in a way he was among the pioneers. He said: "The most prominent cause of this increased cost is the great speed and small tonnage of the freight trains, and too many passenger trains lightly loaded." He brought forward tremendous masses of figures, some of which were relevant and more were not, but his whole argument was unconvincing because he had to base very much of it on assumed figures. The essential traffic figures did not exist, and to-day they do not exist. Only one railroad in Great Britain possesses them, even on its own books, and that road possesses them for only a few months back. Mr. Dorsey had to guess at his ton-miles, his passenger-miles, his train and carloads, and also he had to guess at the rates actually paid for the public service rendered. Naturally, those who were inclined to scoff had a fine opportunity and they did not hesitate to use the opportunity.

In the 17 years that have passed since Mr. Dorsey wrote the group of British writers of which we spoke at the outset has grown up and at last it has produced an effect. An important body of opinion has been created, even among railroad men and "private waggon" owners, in favor of changes in working and accounting that shall at least approximate to the methods long ago established in the United States.

Among those whose recent work has been enlightening and influential are the editors of *The Statist*, a London journal of finance and trade. The volume now before us is a collection of studies that were published in that journal in the course of the last 12 months or so. These articles make comparative studies of cost of transportation in England and America, and of the results of working on some important and representative roads. Throughout the discussion runs the note of the necessity of heavier freight train loads and of systematic statistics of the traffic units, train loads, etc. The various contentions of the editors are traversed by sundry representative writers as, for instance, the Chairman of the London & North Western. A group of particularly interesting papers covers the methods and results of workings of the London & North Western, the Midland, the North Eastern and the Lancashire & Yorkshire. These chapters will, we take it, be of greatest interest to American readers.

A chapter is given to the working of the railroads of India, and to their experience of the value of ton-mile statistics, and incidentally the following table is introduced to show the growth of train loads:

Year.	Lake Shore.	East Indian.	North Western.
	Tons.	Tons.	Tons (estimated).
1872	134	114	59
1880	252	148	66
1890	268	202	66
1900	455	196	69

The reader knows, of course, that the Lancashire & Yorkshire began some months ago the use of mineral cars with a capacity of 30-tons. He knows also that the North Eastern Railway has changed its working organization recently, introducing essentially the American scheme, and that it has also begun a systematic compilation of those statistics of which we have spoken so frequently. All of this is important and interesting and cannot fail to do good.

A very interesting part of the volume is the introduction, by Mr. George S. Gibb, General Manager of the North Eastern, whose recent visit to the United States is still fresh in the minds of many American railroad officers. That introduction is in the main an argument for the compilation, by the British railroads, of those missing statistics and the argument is so lucid, so reasonable, and withal so thoroughly well-informed that it actually sheds light on a subject that has been a good deal obscured by pedantry, prejudice and ignorance.

Eastern Maintenance-of-Way Association.—The nineteenth annual convention of this association was held in Rochester, N. Y., last September. A pamphlet copy of the proceedings has reached us, and it may be obtained by addressing the secretary, Mr. F. C. Stowell, Boston & Maine R. R., Ware, Mass. The pamphlet contains reports of committees, papers, discussions, constitution and list of members.

Massachusetts Highway Commission.—The ninth Annual Report of the Massachusetts Highway Commission, being for the year 1901, has just been issued. It may be obtained from the Secretary, Mr. Austin B. Fletcher, 4 Mount Vernon street, Boston, Mass. The commission had $500,000 available for the year. It laid out 62 miles of road, making a grand total of 378 miles. Nearly all of this has been built. Apart from the State roads the towns have built since 1894, 500 miles of macadam road. The cost per mile of the road built in the year 1901 is given in a detailed table; it is hardly worth while to attempt to give average cost. Another table gives cost per mile of maintenance.

Logarithmic Tables of the Measures of Length, extending from 0 to 50 Feet, at Intervals of One-sixteenth of an Inch. By Thomas Marshall. New York: The Engineering News Publishing Co., 1902. $2.00.

These tables are designed principally for computers and draftsmen, and will be found of a good deal of use in bridge and structural works. Their scope is sufficiently indicated by the title. The book is not so complete as Smoky Tables in that the latter vary by thirty-seconds of an inch and also give squares as well as logarithms, but Marshall's book is smaller and cheaper. The volume is a small pocket-book, of 106 pages, well arranged and well printed. $2.

The Railway Transition Spiral. By Arthur N. Talbot, C.E., Professor of Municipal and Sanitary Engineering, University of Illinois. Third Edition, Revised. Pocket-book, 110 pages, flexible morocco. New York: Engineering News Publishing Co., 1901. $1.50.

Professor Talbot's treatment of the railway transition spiral was first published in 1890, and was published in field book form in 1899. This third edition has been enlarged somewhat in that the tables have been extended and a treatment of the uniform chord length method and of street railway spirals has been added. Mr. Talbot's spiral is a flexible easement curve of general applicability and of comparatively easy analysis. It has been a good deal used on railroads, and its application has been found little more difficult than the use of the circular curves.

Easy Lessons in Mechanical Drawing and Machine Design. By J. G. A. Meyer, author of "Modern Locomotive Construction," etc. Two volumes, quarto, 680 pages, numerous illustrations, and index. New York: Industrial Publishing Co. Volume 1, $6.00; volume 2, $4.00.

Mr. Meyer died July 16, 1900, leaving behind him the manuscript and drawings for about three-quarters of this work. Before his death he expressed the wish that the work should be completed by Mr. Charles G. Peker, who had been his assistant for some time, and the second volume bears on its title page Mr. Peker's name. Mr. Meyer was a draftsman in various important establishments for 40 years, and was at one time associate editor of the *American Machinist.* His temperament, the quality of his mind and the work of his life, had all prepared him for producing a book of extraordinary completeness and value, on Mechanical Drawing and Machine Design, which he tried carefully to adapt to the use of students and draftsmen who are obliged to educate themselves in their chosen art. His purpose was "to provide the beginner with a series of carefully graduated, easy and comprehensible lessons forming a full course of practice and instruction in mechanical drawing and the elements of machine design." He has chosen practical examples designed so far as is possible to give information that shall be useful in practice, while at the same time giving drill in the construction and execution of the drawings. There is some elementary instruction in geometrical problems, and there is careful information about the selection, care and use of instruments. The work then goes on progressively through the elementary stages, leading gradually up to complicated machinery details. For the young engineer who wishes to be a draftsman (and every engineer should have skill and facility as a draftsman) we can imagine no more valuable book than this. Its only drawback is its cost, which naturally must be too great for many of those for whom the work is especially designed.

A Text Book on Roofs and Bridges. Part III. Bridge Design. By Mansfield Merriman and Henry S. Jacoby. Octavo, 374 pages, engravings, index. Fourth edition. New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1902. $2.50.

This is a working text book of the right kind; it is simple, systematic, compact and full in detail; the engravings are good and the index appears to be reasonably full. An unusual, and a valuable feature, is the collection of references to books and to articles in periodical journals. For instance, the chapter on history and literature concludes with four pages given to a list of the most useful books, going back as far as Pope's Treatise on Bridge Architecture, published in 1811, and giving Whipple, Haupt, Vose, Merrill and others of the fathers of the art, together with the best of the later writers. The chapter on tables and standards gives a list of those valuable handbooks which the manufacturers now issue, and references to specifications and monographs published in various journals. The chapter on details of plate girder bridges closes with eleven pages of references to articles in the technical journals, and the chapter on details of railroad pin bridges has three pages of similar references.

We are informed in the preface that this edition has been entirely rewritten in order to bring the subject up to date, "for the changes in bridge design during the past eight years have been remarkable. . . . There has been a general revision of specifications and careful addition to the design of details so as to secure greater stiffness." As compared with the third edition this one has been increased from 316 to 374 pages, and the cuts from 57 to 149.

Of course we need not remind the reader of the quality of the work of these authors, either in its scientific completeness or in the method of treatment. Few technical writers have Professor Merriman's instinct for clear and compact statement, or his power of judicious generalizing from well selected facts; and his colleague in the preparation of this treatise commands a great range of accurate knowledge. The book gives numerous examples, selected from structures designed by the best engineers and actually built, and these examples go into the details as well as general designs.

TRADE CATALOGUES.

Messrs. Walter Macleod & Co., 467 East Front street, Cincinnati, Ohio, send us a catalogue, No. 51, containing descriptions of pneumatic forges, hammers, heaters, etc.; also tire heaters, paint and whitewash sprayers, and various lights for contractors and shops. In fact, the pamphlet shows a variety of things, not even suggested in this abstract.

A. Leschen & Sons Rope Co., St. Louis, Mo., New York and Chicago, manufacturers of wire rope and cordage, has issued a catalogue of its product, giving illustrations, descriptions and price lists. In addition to wire rope, steel cables, cordage, sheaves, blocks, etc., this company builds aerial wire rope tramways. It was recently awarded a contract for a tramway connecting a group of mines with a smelter at Grand Encampment, Wyo., which is to be 16 miles long. It is claimed to be the longest aerial tramway in the world.

The Standard Tool Co., Cleveland, Ohio, is calling special attention to its cotters and keys, of which it produces an extensive line. Its spring cotters and flat spring and riveted keys are intended for use in the manufacture of agricultural implements, hardware specialties, couplers, etc.; cotters longer than 6 in., known as cellar box cotters, are for bridge and car builders and railroads; it also makes brass and copper cotters for manufacturers of electrical apparatus. Price lists and circulars will be sent on application either from the main office or from the eastern sales office, 94 Reade street, New York.

Pneumatic Tools.—The Philadelphia Pneumatic Tool Co., Philadelphia, Pa., has just issued a 32-page catalogue. It explains the applications of the various pneumatic tools made by the company, including shipping, calking, beading and riveting hammers, rotary drills, foundry sand rammers, yoke riveters, wood boring machines and tampers for concrete and clay. The catalogue con-

tains also some useful information for users of pneumatic tools, including tables of capacities, weights, dimensions and air consumption.

Traveling Electric Hoists.—Bulletin No. 7, a catalogue by Pawling & Harnischfeger, Milwaukee, Wis., contains 28 pages of description, and illustrations of traveling electric hoists. Shop and out-of-door operations are shown on curved and on straight runways. Cranes of one and two motor design of various types are described, the lifting capacity ranging from one to six tons. A partial list of manufacturers now using these hoists is given.

Pneumatic Hammers.—Fairbanks, Morse & Co., Chicago, Ill., have just got out a new and improved pneumatic hammer which is illustrated and described in a pamphlet that will be sent, on application. It is claimed that this hammer is lighter than other hammers and that the recoil is reduced to the minimum. The parts are very few and simple; the tool is made in four sizes. A sample hammer will be sent for trial.

The American Machinery & Export Co., 122 Liberty Street, New York City, has issued a 28-page catalogue 3¼ x 6 in., containing illustrations and descriptions of portable track, cane cars, cane unloaders, steam plows and light locomotives. The company makes a specialty of these articles for export. The catalogue is known as Bulletin No. 10 and is printed also in Spanish.

The Ingersoll-Sergeant Drill Co., New York City, (which has the agency for foreign countries), send us a catalogue, 6 in. x 9 in., descriptive of the Baldwin acetylene lamp for mines. The pamphlet contains full information as to cost, together with a number of testimonials from mining companies who have used the light.

The Dressel Railway Lamp Works, New York City, have issued two pamphlets, one descriptive of Herculean signal lamps, the other describing the Dressel long-burning oil font for semaphore, switch and signal lamps.

"*Tests*" is the title of a four-page pamphlet issued by the H. W. Johns-Manville Co., New York City, giving results of recent tests of its Keystone hair insulator.

The Niles-Bement-Pond Co., 136 and 138 Liberty street, New York City, has just issued a small pamphlet designed for distribution at the Crystal Palace Exhibition in London. It gives examples of the product of the Niles Tool Works, the Bement-Miles Works, the Pond Machine Tool Works and the Crane Works. Very pretty engravings from photographs are shown, with the shortest possible description, and the tools include lathes, planing machines, shaping and slotting machines, boring and turning mills, hammers, cranes, etc.

Valves, Fittings and Engine Supplies.—The Crane Company's catalogue, dealing with standard, medium and low-pressure valves and fittings and steam engineers' supplies, has just been issued. It contains 362 pages, and has a very comprehensive index. All kinds of brass globe, angle, check and safety valves are enumerated and cuts, sizes and prices are given in each case. Heavy iron cocks not intended for steam or water are illustrated, also valves with iron bodies and brass trimmings are shown. This company makes locomotive open and muffler safety valves, malleable, cast and wrought iron pipe fittings, also finished and nickel-plated brass trimmings. It also deals in hose goods with magnesia and asbestos coverings, and is prepared to supply a full line of steam fitters' tools. In some cases the numbers on the various articles have been changed, so that when ordering, the present 1902 catalogue should be used, in order to prevent confusion. Altogether the book is useful for reference with its many tables of sizes and prices.

Fire-Box Stays.

At the meeting of the Institution of Civil Engineers on Tuesday, the 15th inst., the paper read was "Locomotive Fire-box Stays," by F. W. Webb, Vice-President Inst. C. E., and Chief Mechanical Engineer of the London & North Western.

The author considered first his experience of the use of copper fire-box stays in the four-cylinder compound passenger engines of the London & North Western, working at a steam-pressure of 200 lbs. per sq. in. Forty engines ("Diamond Jubilee" class) stayed with 1 1/16-in. copper stays had, up to December, 1901, run a total mileage of 5,622,064 miles, the stays renewed being 1 per 844 miles. These engines were the hardest worked on the system, the average speed being 50 miles an hour, hauling a load of 350 tons to 400 tons, including engine and tender; and many ran 158 miles in 3 hours and 10 minutes without a stop, consuming coal at the rate of one ton per hour.

The 10 latest four-cylinder compound passenger engines ("Alfred the Great" class), boiler-pressure 200 lbs. per sq. in., stayed with 1 1/16-in. stays, up to December, 1901, had run a total mileage of 277,800 miles, but no stays had had to be renewed.

The various alloys which the author had tried, as substitutes for copper, viz.: copper-zinc alloy (40 per cent. zinc); copper-zinc alloy (9 per cent. zinc); copper-tin alloy (3 per cent. tin); copper-aluminum-alloy (7¼ per cent. aluminum); and mild Bessemer steel, were next dealt with, it being concluded that, all things considered, none of them showed any improvement on copper (except perhaps the 9 per cent. copper-zinc alloy).

The author then outlined the results of an investigation as to the comparative suitability of copper and copper alloys for fire-box stays. The temperature the furnace end of the stay might attain was first considered, and the chemical analyses and tensile tests at temperatures from 60 deg. to 750 deg. Fahr., of six different materials for stays were given. All the specimens were very uniform and homogeneous in structure, except the copper-aluminum alloy. Pieces from the same rod of this metal showed a great variation in structure, from small crystals to very large crystals; and in some instances the small and very large crystals occurred in bands in the same specimen. While the tests of this alloy, at 400 deg. Fahr., and upwards, were in progress a sharp grating noise was heard when the test-piece was extending, which increased in distinctness at the higher temperatures. On examining the specimens after fracture, a number of transverse cracks varying in size were observed.

With a view to ascertain the conditions of the joint after riveting a stay in position, specimens had been prepared and riveted into a piece of copper plate and also into a copper fire-box. They had then been cut out with the copper of the plate surrounding the threads of the stay, and sectioned longitudinally. It had been observed that the copper stays were the only stays that had made a really good joint, each of the others showing distinctly imperfect contact between the threads of the stay and the plate, the effect of riveting having been to expand the hole at the base of the plate, and also to damage the copper plate under the riveted head. The importance of the relative hardness of the stay and of the copper plate led to the determination of the hardness by Professor Unwin's "Indentation Test," which had shown that the hardest metal had made the worst joint.

In conclusion the author considered that whatever the composition of the stay might be, it should be relatively softer than the copper fire-box plate into which it was intended to be riveted, in order to make a satisfactory joint.

The Interstate Commerce Commission's Car-Inspection.

(*Continued from page 327.*)

made up in the yards. Under the old conditions it was not safe to run trains as fast as we now do, nor was it safe to switch or handle them in the yard as rapidly and as roughly as we now do.

There has been quite a little talk about the increased damage to cars, and probably, without stopping to think, we sometimes attribute it to the brakes and couplers. I think this is doing both these devices a great injustice. We ought to realize that under the same condition of speed and rough handling the damage under the old condition of things would be many times more severe. In our Black Hills territory, where the grades are steep, we have such confidence in the brakes that we do not allow cars to be hauled in freight trains unless every car is equipped with air-brakes. Of course, they all have the close-fitting automatic coupler.

I feel that our railroads, through their Master Car Builders' Association and American Railway Association; and the Government, through its Interstate Commerce Commission, have every reason to feel proud of the work they have jointly produced in the way of introducing uniformity in the matter of automatic couplers and power brakes for the trains of this country.

LETTER FROM MR. GEORGE W. STEVENS.

Experience on our line has been favorable to the safety appliances; certainly no one can say that the air-brake is not a distinct step in advance in the matter of handling freight trains more economically, and with greater safety. The general design of the automatic coupler is, in our opinion, all right, and the weak points are gradually being discovered and remedied. I have not seen a car-coupling appliance so far that could be compared with the master car builders' type. All that is necessary, in my opinion, is to improve this type until the couplers that are put in service are of sufficient strength to perform what is expected of them. I cannot say that there has been any economy at terminals by reason of these improved appliances. There has been a greater number of bad-order cars accumulated at terminals than before the automatic coupler was universally in use, owing to the men in charge of switching not being as careful as they were when one of their number was expected to go between the cars to make the coupling. However, this is a matter of discipline, and can be corrected in due time.

LETTER FROM MR. F. A. DELANO.

The element of danger being largely removed, the cars are not handled as carefully as they were formerly. This also manifests itself in the number of claims for damages to freight injured by rough handling of the cars. Much of the damage, however, for which the coupler is held accountable is caused by light draft-timbers and weak attachments which have not been properly strengthened to withstand the increased strain.

Considering the subject of power brakes, it would be extremely dangerous and practically impossible to operate the present trains at the prevailing speeds without the use of power brakes. The switcing in terminal yards is also greatly expedited by the power brakes on the engines, and the ability to stop quickly when necessity arises undoubtedly averts many accidents.

At Chicago terminals we keep a careful record of all employees and others injured. In the year 1895 we had 28 employees injured in coupling and uncoupling cars, whereas in 1901 (not quite closed) there have been only three such injuries.

The superintendent of our lines in Iowa says there is no doubt in his mind that the introduction of master car builders' couplers has decreased personal injuries in coupling cars; that it has also decreased the number of break-in-twos in transit, but the results from break-in-twos seem to be a little more serious with the master car builders' coupler than they used to be with the link and pin. In complying with the law about putting on couplers a good many poor couplers were put into service, and a great many of the good couplers have become worn beyond the danger limit.

LETTER FROM MR. A. M. WAITT.

I am strongly of the opinion that on many roads the number of trains breaking in two has increased rather than diminished by the introduction of automatic couplers, as some makes of couplers seem to be prone to uncouple while moving on the road. It is also true that the lack of inspection and maintenance of the couplers is often productive of breaking in two, owing to the condition of the lock on couplers preventing its dropping fully into its locking position.

With our heavier locomotive equipment, permitting the hauling of much longer trains, there has been a quite considerable increase in coupler breakage,, and it has become somewhat problematical as to whether the present dimensions of automatic couplers are productive of economy in connection with the cost of maintenance as compared with well-constructed link-and-pin couplers. I would not for a moment advocate the return to the link-and-pin coupler, but I believe the time has come for an advance step in the way of quite considerably strengthening the present automatic couplers. It is desirable to recommend and require, in the line of better service and economy, couplers to be made of good cast steel, and I am almost converted to the advisability of increasing the size of the shank of couplers on all new equipment, and as far as possible in connection with renewals on old equipment. Referring to power brakes, complaints are often made that the introduction of air-brakes on cars has increased the number of cases of trains parting. I think, however, that a little consideration will show that this ought not to be charged to the power brakes, but rather to the lack of them on too many cars. Possibly the New York Central road is running freight trains entirely equipped with air-brakes to as great an extent or greater, than most other roads in the East, and we find very little trouble from trains parting, or other objectionable features, in connection with such fully equipped trains.

LETTER FROM MR. P. H. MORRISSEY (BROTHERHOOD OF RAILROAD TRAINMEN).

I hand you a comparative statement of deaths and total disabilities from railway accidents among members of the Brotherhood of Railroad Trainmen for the years 1899, 1900 and 1901. Since Jan. 1, 1899, the balance in our insurance fund has increased about $145,000. During this period the amount of the assessment paid by each member yearly has remained the same, and the laws of the organization pertaining to the payment of death and disability claims have not been essentially changed. This gradually appreciating surplus is due to the decreasing death and disability rate from accidental causes, for in the same period the death and total disability rate from natural causes has shown some increase.

The value and practicability of the inspection of safety appliances by inspectors appointed by the commission has been noticed by our members and is generally appreciated.

B. R. T.—Statistics for Three Years.

Year.	Average membership.	Deaths.	Total disabilities.	Proportion of deaths.	Proportion of total disabilities.
1899	34,700	301	166	1 in 115	1 in 209
1900	40,892	327	169	1 in 125	1 in 242
1901	45,900	247	93	1 in 186	1 in 493
Balance in insurance fund Jan. 1, 1899.....					$262.281
Balance in insurance fund Jan. 1, 1902.....					*408,000

*Estimated.

The appendix to the report contains a dozen pages of reports from the individual inspectors. These reports tell in considerable detail what the inspectors have found in the visits which they have made during the past year. An abstract of the subjects dealt with in these reports follows:

Inspector B.—Rough handling in yards; due to couplers that work hard and to weak draft gear; in crowded yards men are overzealous. Home cars are better cared for than foreign. Agreements between local agents interfere with prompt repair work. Some roads own no cars. Air-pumps on engines are too small. Coupling levers should run entirely across the car. More air-brake inspectors are needed; also better shop equipment. Hand-brakes are put on so that they work opposite to air-brake levers.

Inspector C.—Managers have now waked up to their duty; but it is hard to get good shopmen. New couplers on old cars are often imperfectly fitted. Contour lines are not exact. Cored knuckles are used. A coupler with an automatic lock set, when broken and replaced by another, makes trouble; there is nothing to hold up the lock. Standard and narrow gage cars should not be mingled. Men run in front of cars to open knuckles. A knuckle kicking device is needed. Miller couplers are still in use. The railroads ought to agree to use only a few of the best couplers. Cabooses are in service without coupling levers. Many freight trains are running with only 40 per cent. of air cars. On long freights the

air-pump is over-worked. Trains are controlled on grades by the hand-brakes; this would be unnecessary if the retainers were used. Ignorant repair men are encountered now and then. Instruction cars ought to instruct repair men. Triple valves will hereafter be better cared for. Managers receive the inspectors in a friendly spirit. A better class of men than formerly is now found in yards.

Inspector D.—Employees are satisfied with present conditions and prospects.

Inspector E.—There has been opposition by officials; now apparently overcome. Yard work is done very much faster; an engine will now take 35 cars at once to be distributed. Defect cards should be used more systematically.

Inspector F.—In deep snow yardmen can work four times as fast as formerly. Break-in-twos are now harmless if all the cars in the train are air-brake. The conductor's valve should be made more available.

The New York & Port Chester Railroad.

The New York & Port Chester Company was incorporated in New York, April 3, 1901, to build a four-track electric road from a connection with the Rapid Transit Railway at 132d Street, Borough of the Bronx, to Port Chester, a distance of 21 miles. Permission to build was granted by the Railroad Commission on April 9, 1902, and it is proposed to start work at once, although the opposition in court has not yet ceased.

The project has some unusual features. From one end of the line to the other, no highway or railroad is crossed at grade, although there are 78 of such crossings to be provided for. Power is to be taken from a third rail, and this is to be safeguarded by some form of covering as well as by the fencing of the line, all of which is on private right of way. Two of the tracks

The track will be 90-lb. rails laid on white oak ties, with 10 in. of broken stone ballast brought up to surface of tie, as in the standard Pennsylvania Railroad construction. There will be 85 bridges on the line of the concrete arch type. The contracts for these have not yet been awarded, and, in fact, no contracts have been let, although the specifications for the power house equipment are now ready.

Each car will be equipped with four motors, and some form of multiple-unit control will be used. The weight of each car, loaded, will be 52 tons. (The weight, loaded, of the cars on the Manhattan Elevated, is 35 tons). The cars will be 62 ft. long over all, 9 ft. 3 in. wide, outside measurement, and each car will contain 42 cross seats, seating 84 persons. The wheels will probably be 42-in., with 7-in. axles. About 70 cars will be required for the service, and they will all be equipped with air-brakes. The number of cars in each train will vary according to the hour of day, etc.

Final location of the line is now in progress, and it is expected that grading will be begun this fall. W. C. Gotshall, 76 William street, New York, is President, and Mr. Gotshall and C. O. Mailloux are the engineers in charge of design and construction.

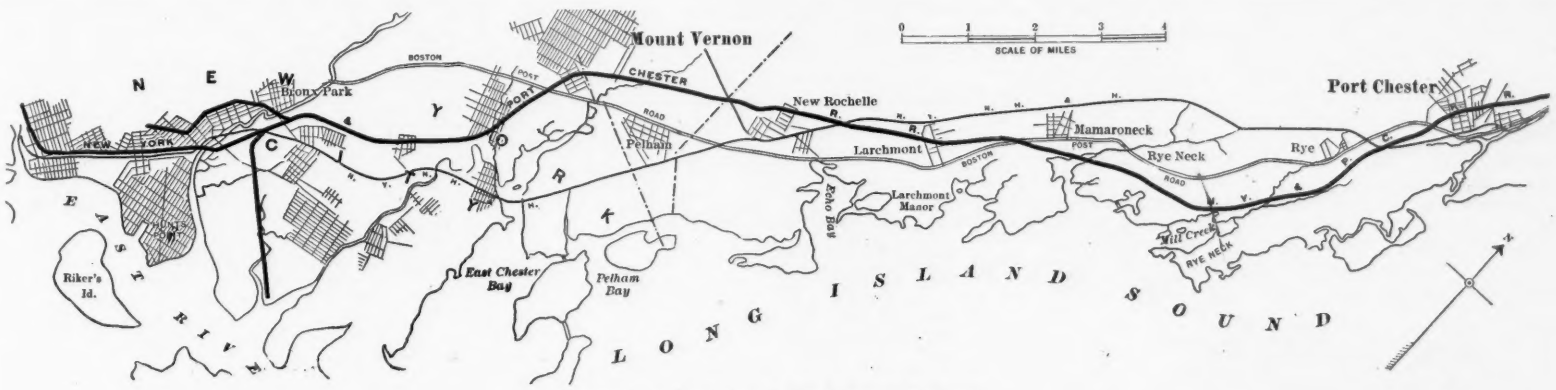
London Underground Railroad Schemes.

The Select Parliamentary Committee which was recently appointed in London to consider the dozen or more "tube" electric railroad proposals of which notification recently appeared in the *Railroad Gazette*, commenced its proceedings April 16th under the presidency of Lord Windsor. There was an unusually large crowd of counsel and the numerous parties whose interests are affected, much opposition being set up on the question of vibration and compensation to landowners in respect thereof. Lieut.

pressure was to be 100 lbs. per sq. in. There was a steam dome 39 in. high and 39 in. in diameter. The boiler was made of two sheets, each of which was the full length of the boiler, and the sheets were riveted together with ¾ in. rivets pitched 3 in. longitudinally and 2 in. transversely. The seams were made by two longitudinal laps of the sheets, running the full length of the boiler, the lap being made at each side, on the horizontal centerline of the shell.

The boiler had been inspected regularly and had been reported in good order but a short time before the explosion. It was brought out by the evidence at the coroner's inquest, that there was plenty of water in the boiler and no question of burned sheets entered into the consideration of cause. It was found that the boiler steel averaged about .03 in. less than the specified thickness, and that the metal was extremely brittle. There was no difficulty in showing that the rupture occurred at a point in one of the seams, near the mid-length of the boiler, and was concealed by the lap of the sheets until the explosion occurred. It was, in short, a graphic demonstration of the danger of using a lap sheet on any boiler, and particularly in factories where the lives of many employees are likely to be sacrificed by the development of similar unseen defects. The first fracture was not in the line of rivet holes, but, in the disruption that followed the first break, the line extended into the rivet holes and the boiler was completely torn apart and straightened out finally into an irregularly flat sheet.

In the article written by Prof. Carpenter, it is said that the metal was so brittle that it was easy to knock off pieces of the sheet with a hammer, and that those pieces did not show any signs of elongation or reduction in area. In the verdict of the coroner's jury the Penberthy Injector Company was entirely exonerated from blame and the responsibility for the explosion was placed on the makers of the boiler. The jury stated specifically



Route of the New York & Port Chester Railroad.

will be used for express and two for way trains, the services being quite distinct, with different terminals. The express trains will run on the Rapid Transit structure as far as 177th street; the locals will make their terminus at Willis avenue and 132d street, in connection with the East Side branch of the Rapid Transit road. The express stations will be at Willis avenue, 149th street, Bronx Park, Bronx and Pelham Parkway, Mt. Vernon, Pelham, New Rochelle, Larchmont, Mamaroneck, Rye Neck, Rye and Port Chester, ten in all, and the 21 miles will be run in 31 minutes, the stop at each station being 15 seconds. The maximum speed of these trains is to be slightly over 60 miles an hour, with an average running speed of 39.9 miles. The fastest trains on the New Haven road require 39 minutes for their run between Port Chester and the Grand Central Station, without intermediate stops, and the locals take about an hour. When the subway is completed and through connections are made, the Port Chester company expects to make the run from the City Hall station, Manhattan, to Port Chester, in 54 minutes, and through trains will be run. The locals will make 20 stops, and cover the distance between Port Chester and 132d street in 49 minutes.

The track is on a series of undulating grades, of which the sharpest is 1.714 per cent., extending for 0.86 of a mile. There are also several level stretches, of which the longest is a trifle over a mile. The following list of grades reads from Willis avenue toward Port Chester, and, exclusive of a few hundred feet at the terminal, shows the profile of the line complete:

Distance in miles.	Grade, per cent.	Distance in miles.	Grade, per cent.
.011	Level	.860	+1.714
.159	—1.3	.493	— .080
.159	Level	.500	—1.623
1.023	— .283	.463	— .900
.078	Level	.521	+ .364
.241	+ .348	.628	— .433
.165	— .286	.712	+ .122
.022	Level	.755	— .300
.127	+ .433	.776	— .244
.206	Level	.664	+ .286
.229	+ .650	.568	+ .733
.275	+ .475	1.285	— .221
.378	+ .163	1.022	Level
.576	— .561	1.108	+ .424
.165	— .050	.301	+ .050
.113	—1.52	.240	+1.08
.382	— .180	.388	— .561

A count of curves, taken from the company's plan, gives the number as 32, of which the sharpest is 7 deg. 10 min., and the next sharpest 4 deg. There is only one curve on the line of 7 deg. 10 min., but the 4 deg. curves are frequent.

The Penberthy Boiler Explosion.

Soon after the explosion of a boiler in the Penberthy Injector Company's works at Detroit on Nov. 25, 1901, we gave a short note telling of that accident in which several people were killed and others were seriously injured. Subsequently a careful investigation was made by Prof. R. C. Carpenter, of Cornell University, and Prof. M. L. Cooley, of the University of Michigan, and we now give a few of the results of that investigation as published in *Power* for April.

The boiler that failed was 66 in. in diameter, 16 ft. long, and had 64 four-in. tubes. The specifications to which it was built required flange steel with a tensile strength of 60,000 lbs. per sq. in., the shell to be ⅜ in. thick, and the heads ½ in. thick. The working steam

Colonel Yorke was called to open the ball by stating the views of the Board of Trade upon the necessity for taking every possible precaution to obviate risk of fires occurring in the tunnel, and as to the danger of small "tubes" which did not permit of passengers getting out at the side of a carriage in the event of mishaps. He advocated the fitting up of tunnels for lighting immediately occasion might arise, and thought that the matter of ventilation demanded more attention than it had received so far. He repeated the advice given in his report on the Liverpool tunnel accident to the effect that wood should not be employed for tunnels, signal cabins, nor even for sleepers. A higher tunnel he regards as essential so as to allow of trains being replaced on the rails without delay after derailment. No doubt the Colonel had in mind a recent derailment on the Central London Railway, which occasioned prolonged stoppage of a portion of the line. The Board of Trade is endeavoring to secure powers to have a hand in the constructional details of new tunnel railroads, instead of its present very limited powers which only allow of inspection after the systems are completed.

Col. Yorke has recently been making an investigation into the Paris shallow subways, of which one short section is in operation. His recital of the difficulties encountered in the construction work, led up to a comparison of deep-level "tubes" and shallow tunnels. His conclusion is that for new streets the idea is practicable, but for old London streets which have a congested network of underground piping, mains and so forth, it is hardly to be commended.

that they had found that the boiler was not constructed of the material nor in the workmanlike manner called for by the specifications.

TECHNICAL.

Manufacturing and Business.

The Chicago office of Valentine & Company, varnish makers, has been moved from 390 Wabash avenue to the Fisher Bldg.

Messrs. Sponn & Chamberlain, publishers of engineering and technical books, have recently moved to the Liberty building, No. 123 Liberty street, New York City.

A. S. Anderson, representing the Standard Railway Equipment Co., of St. Louis, and the Murphy car roofs, has opened an office at 122 Liberty street, New York.

Ward S. Arnold, for some years with the General Electric Company's Chicago office, has accepted the position of Sales Engineer to the Chicago office of the Stanley Electric Manufacturing Company.

The Wells Light Mfg. Co., New York City, has had returned for repairs, by the New York Central & Hudson River, a No. 3 light which was sold to the road in March, 1892. After a few hours' work refitting, the light was returned to the railroad in as good condition as when first bought.

The Southern Car & Foundry Co., which has heretofore been operating the Anniston Works of the Illinois Car & Equipment Co., which includes the rolling mill, car building plant and car-axle works, has bought all this property. The plant at Anniston is said to be the largest and best equipped in the South.

Two rotary converters of 300 K. W. each have recently been bought by the Manchester (N. H.) Traction, Light & Power Company from the Westinghouse Electric & Mfg. Co. They will be placed at Hooksett, N. H., and will deliver power for the operation of the Concord and Manchester branch of the Boston & Maine Railroad. The machines are to be supplied with three-phase alternating current and will deliver direct current at 600 volts. The Westinghouse Company has also recently sold two rotary converters to the South Covington & Cincinnati Street Railway Company, one being of 200 K. W. capacity, and the other of 400 K. W. capacity.

The Bullock Electric Manufacturing Company of Cincinnati, Ohio, is building for its own use, what is probably the largest lathe ever set up in the United States. The cost of the machine will be in the neighborhood of

$40,000. The lathe is designed for turning up fly wheels 44 ft. in diameter, and it will be used on the largest work ever undertaken in the manufacture of dynamos and electrical engines. The weight of this tool is said to be 200 tons. It is estimated that 50 h.p. will be required to drive it. This machine will go in the new shop now building, and which will be 177 ft. wide and 1,200 ft. long, with a main aisle 75 ft. wide and two side aisles 50 ft. wide. There will be 50 ft. clear head-room under the main aisle crane hooks and 30 ft. under the side aisle crane hooks. In addition to this building the company is extending another building, making it 250 ft. by 100 ft., two stories high. It is also putting up a service building 50 ft. by 160 ft. and two stories high, containing wash rooms, etc., leaving the present office building free for office work.

Iron and Steel.

Harry G. Hudson, recently appointed master mechanic of the Big Four at Wabash, Ind., has resigned to become Manager of the Alliance Steel Co.

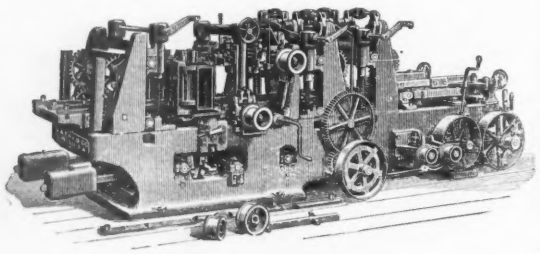
It is announced that E. O. Hopkins, President of the Sloss-Sheffield Steel & Iron Company, has resigned, and that J. C. Maben has been elected his successor. Archer Brown has resigned as a director and was succeeded by H. O. Seixas.

Dry Dock at Brooklyn Navy Yard.

Plans and specifications for a large masonry dry dock to be built at the New York Navy Yard are said to have been prepared by the Bureau of Yards and Docks, Navy Department, and advertisements for bids will soon be issued. A million dollars was appropriated by Congress for this dock. Plans have been prepared also for a new masonry dock at the Norfolk Navy Yard to cost not more than $1,500,000.

A New Planer, Matcher and Jointer.

The J. A. Fay & Egan Co., Cincinnati, Ohio, have recently brought out the machine here illustrated. It is their No. 26 heavy six-roll double-cylinder planing, matching and jointing machine, and is the largest and heaviest combined planer and matcher they build. It is especially useful for car building and repair shops. It will plane to 30 in. wide, and 14 in. thick, and will work simultaneously three sides of two pieces of material of uneven thickness up to 12 in. wide and 14 in. thick. The frame is massive, perfectly jointed and bolted to insure rigidity. The steel cylinders are slotted on all their faces, and have chip breakers for working cross-grained or knotty lumber. The matching works are very substantial, of improved construction, and are fitted with a patent weighted matcher-clip, producing an even pressure



on material. The feed works consist of six powerfully-driven rolls, easily raised and lowered, and heavily weighted. The rolls are divided, have accurate adjustments, and are always kept in true alignment. The feed is powerful, steady and uniform, and can be regulated.

American Locomotives in Bavaria.

Vice-Consul-General D. B. Mason, writes from Berlin: "Concerning the much-discussed subject of the Baldwin locomotives, which were purchased for trial, examination, and for the suggestions which their construction might afford to the Bavarian engine builders, the Berlin *Morning Post* of February 13 contains the following interesting paragraph: 'The statement is often made, when the danger of American competition is under discussion, that American manufactures can not compare with German goods in quality. It was reported recently that the four engines which were purchased for the Bavarian railroads had not been satisfactory as to durability. In refutation of this report, it has been officially stated that the American express and freight engines have been very satisfactory, owing to the simplicity of their construction, both as to work and durability, and as yet there is nothing to indicate that they will not last as long as engines built in Germany. Some of the parts are now considered so simple and effective that they will be used as models in further construction.'"

To Build Cars in Nova Scotia.

The Nova Scotia Steel & Coal Co., which operates an extensive plant at New Glasgow, N. S., contemplates extending its business and build steel cars at the rate of about 10 cars a day. At present, however, until its new plant can be built, the company will make wooden box cars. General Manager Thomas Cantley will soon visit Philadelphia, Pittsburgh and other cities with a view to looking further into this matter; also to get a man to manage the works.

Goodwin Cars for the Coal Trade.

It is expected that about May 1st five Goodwin gravity dump cars, loaded with Cumberland lump coal, will be received at the Curtis Bay Docks of the Baltimore & Ohio Railroad, in Baltimore. The object of the shipment is to demonstrate the effectiveness of the Goodwin method of handling lump coal at terminals by the use of these cars. The discharge being operated by air from the locomotive which places the car, economy of time and labor may be looked for.

Wire Rods and Wire Nails in the United States in 1901.

Statistics published by the American Iron and Steel Association show that the production of iron and steel wire rods in the United States in 1901 amounted to 1,365,934 gross tons, against 846,291 tons in 1900, 1,036,398 tons in 1899, and 1,071,683 tons in 1898, showing an increase of 519,643 tons, or over 61 per cent., in 1901, as compared with 1900. Of the total production in 1901, 1,365,459 tons was steel and 475 tons was iron rods. The production of steel wire nails in the United States in 1901 amounted to 9,803,822 kegs of 100 lbs., as compared with 7,233,979 kegs in 1900, an increase of 2,569,843 kegs, or over 35 per cent. In 1899 the production amounted to 7,618,130 kegs, in 1898 to 7,418,475 kegs, in 1897 to 8,997,245 kegs, in 1896 to 4,719,860 kegs, and in 1895 to 5,841,403 kegs.

Steam Turbines for the London Underground.

Westinghouse steam turbines are to be adopted in the electric generating station to be built for the Metropolitan Railway Company of London, the contract having just been given to the British Westinghouse Electric & Manufacturing Co., which is filling a similar contract for the Metropolitan District Electric Traction Company. As there will be a general similarity in the two stations, it will be easy to arrange for connecting the two and making them interchangeable, as far as the supply of current is concerned, which feature was required by the terms of the franchises of the two roads. The Metropolitan power station will be at Neasden in London, and will contain three sets of 3,500 kilowatts capacity each. The Chelsea station of the Metropolitan District Railway will contain four sets of 5,000 kilowatts each. The electrical machinery for both stations will also be supplied by the Westinghouse Company. The current will be three-phase alternating, of 10,000 volts, to be transformed in sub-stations to direct-current for use in the car motors. The steam for the District and Metropolitan plants will be generated in water-tube boilers. The aggregate power of the two plants will be 30,500 kilowatts. It is hoped that in a year and a half the equipment will be complete and in working order.

THE SCRAP HEAP.

Traffic Notes.

After the end of May the California limited trains on the Atchison, Topeka & Santa Fe will be run twice a week instead of every day, as at present.

The Delaware, Lackawanna & Western has secured the conviction of a ticket broker at Scranton, Pa., for the illegal sale of a ticket from Scranton to New York. The punishment was a fine of $25, which the Court said would have been greater but for the fact that this was the first suit of the kind brought in the county.

Beginning with the 23rd of June the Quebec Central Railway will have through night passenger trains, on which sleeping cars will be run to and from New York by way of the Boston & Maine and the New York, New Haven & Hartford. This through line will be run, from the New York end, in connection with the new trains to and from Portland, heretofore announced. Going north the time of departure from New York will be 9 p.m., arriving at Quebec at 1 p.m.; returning, leave Quebec at 2:05 p.m., arriving in New York at 7 a.m.

A press despatch from St. Paul says that in 60 days the railroads have carried 136,000 homeseekers westward. Over one-third of the number went to North Dakota and nearly as many went through to Washington. The Burlington did a large business by way of Billings, Mont. About 25,000 cars of freight were carried for these travelers. The movement through St. Paul is at the rate of 6,000 passengers and 1,000 freight cars a week. The population of Manitoba is expected to increase by 30,000 before the end of May, and Minnesota will increase half that number.

The Philadelphia papers say that of the 13 daily express trains, each way, between New York and Philadelphia, which the Reading is to run after May 18, the first four in the morning northward—7 o'clock, 8 o'clock, 9 and 10—will be two-hour trains; and in the opposite direction this time will be made by the trains leaving New York at 3, 4, 5 and 6. On the same date the Reading will put on a train between Harrisburg and New York, via Allentown, to run through in each direction in 4 h. 15 min. The train will leave Harrisburg at 8:15 a.m., and New York at 5:30 p.m. The distance is 180 miles, which is about 13 miles shorter than the distance between these cities by the Pennsylvania road.

Classification of Freight Earnings—Hearing at Washington.

The Secretary of the Interstate Commerce Commission announces that a hearing will be held at Washington, May 9, to consider the question of the best form of a schedule, to be prescribed for use in the annual reports of railroad companies, classifying ton mileage and freight earnings by commodities. The classification now in use for freight *shipments* (but giving neither mileage nor earnings) is as follows:

Products of Agriculture.—Grain; flour; other mill products; hay; tobacco; cotton; fruit and vegetables.

Products of Animals.—Live stock; dressed meats; other packing-house products; poultry, game and fish; wool; hides and leather.

Products of Mines.—Anthracite coal; bituminous coal; coke; ores; stone, sand, and other like articles.

Products of Forest.—Lumber.

Manufactures.—Petroleum and other oils; sugar; naval stores; iron, pig and bloom; iron and steel rails; other castings and machinery; bar and sheet metal; cement, brick and lime; agricultural implements; wagons, carriages, tools, etc.; wines, liquors and beers; household goods and furniture.

Merchandise.

Miscellaneous.—Other commodities not mentioned above.

Industrial Fair at Düsseldorf.

An exhibition of the industries and trades of the Rhineland and Westphalia will be held in Düsseldorf during the current year (opening May 1). It comprises 25 groups to illustrate the trades, the social, sanitary and educational institutions of the provinces, their agriculture, horticulture, arts and craft. The mining of ore and coal, the production of iron, steel and other metals, the manufacture of articles in foundries, rolling mills and machine shops, and the electrical industry are the trades most conspicuous in the manufacturing districts of the Rhineland and Westphalia. Krupp's building is over 400 ft. in length, with iron-clad towers and a military mast 165 ft. in height. The exhibits of the other large firms are not less important. The number of exhibitors will be between 2,300 and 2,400. A number of congresses will meet in Düsseldorf during the exhibition season. One of the largest is the international river navigation congress; also that of the German Shipbuilding Society, in which the English Institute of Naval Architects and the French Technical Maritime Association will officially take part.

Lehigh University.

Mr. S. M. Vauclain, General Superintendent of the Baldwin Locomotive Works of Philadelphia, and inventor of the Vauclain Compound Locomotive, lectured before the engineering societies of Lehigh University on Thursday evening on "The Locomotive."

Yellowism in France.

We fear we are losing our monopoly of yellow journalism, though the particular journal which has threatened it pretends to be of another color—the "Little Blue" (le petit bleu). It lately announced, with a suitable flourish of head lines, that a casket containing jewels worth 2,500,000 francs had been stolen from an express train between Ostend and Vienna. True it was that a casket of jewels had been stolen; true it was that it had been stolen from an Ostend-Vienna express; a slight "error" of the "Little Blue" made the fact "thrilling" by giving the value, which was actually 2,500 francs, as 2,500,000 francs.

Hambleton on the Steamship "Merger."

"This time it is some half dozen foreign steamship lines which have been acquired. Really, we do not think our English and German cousins can complain. Mr. Morgan will pay them several times what their property is worth. All they will have to do is to invest some of their profits in new steamships, and possibly he will come along in a few years and buy them out again. If reports are true, the foreign steamship lines have not been any too prosperous. If Mr. Morgan can assimilate them at several times their value and make them pay, the former owners should not complain. The new combination calls for an issue of $50,000,000 4½ per cent. bonds, $60,000,000 6 per cent. cumulative preferred and $60,000,000 common stock. Anyhow, under our absurd anti-foreign ship-ownership law, these vessels can not be sailed under the American flag, so that no one will know that Mr. Morgan and his associates really own most of the foreign fleets that sail the ocean blue."

The Washington Union Station.

The bill providing for a Union Station, new terminals and track elevation at Washington was under discussion in the United States Senate during parts of several days last week, but was laid aside temporarily in order to allow an amendment introduced by Senator Patterson to be discussed by the District Committee. This amendment provides that any railroad company whose tracks may or shall connect with or intersect the tracks of any of the companies named in the bill, shall have the right to use the tracks and terminals, including the Union passenger station, on such terms as may be agreed upon; and in case of failure to agree on such terms, the matters in dispute shall be referred to the Supreme Court of the District of Columbia for settlement. At a committee meeting on April 25, which was attended by Vice-President Green, of the Pennsylvania R. R., and President Loree, of the Baltimore & Ohio R. R., the amendment was discussed. While the Committee left further discussion until another meeting to be held this week, it is understood that the railroad representatives are willing to accept the amendment so far as it applies to existing roads, but not for an unknown number of possible future roads. It is probable that a substitute to Mr. Patterson's amendment will be prepared by the committee, and it is believed that any amendment which includes the Chesapeake Beach R. R. will be satisfactory to Mr. Patterson, that being the only existing road not included when the plans for the new terminals were made.

Still Faster Running—Paris to Calais.

The Paris-Calais run of the Nord of France has been famous for a year as the fastest in the world *for the distance*. Now, even a faster schedule is in force. The train, from Paris to Calais Pier, for the convenience of London-bound passengers from Italy and the Mediterranean coast, has had its time-table rearranged. It only runs during the Riviera season; that is to say, during the winter and spring months. If the Paris, Lyons & Mediterranean connection is on time the Northern Railroad train leaves Paris 11.49 a. m., and the run to Amiens, 81¾ miles, is made in 81 minutes, or at the rate of 60.5 miles an hour. The rest of the run, Amiens to Calais Pier, 103¾ miles, is done in 110 minutes. With a four-minute stop at Amiens, the total time occupied between Paris and Calais is 3 hours and 15 minutes, which gives an average speed of just under 57 miles an hour. The new timing is made if the P. L. & M. connection is late. The Northern train is held any time up to 12.30 p. m., when a new schedule goes into force. This is the last moment the train can wait and yet catch the boat. Leaving Paris at 12.30 it is timed to Amiens, 81¾ miles, in 79 minutes, or 62.1 miles an hour. Amiens to Calais Pier, 103¾ miles in 107 minutes, 58 miles an hour. This train is one hour faster than the best train from Euston to Manchester, which takes 4 hours and 10 minutes, against the French train's 3 hours and 10 minutes, the distances being practically equal.

No Anti-Spitting Ordinance Here!

The State Health Officer of Texas has sent a request to the several railroads of the State to put in force the following sanitary regulations on all passenger cars: "Each coach used for passengers must be provided with one cuspidor for each set or for every two chairs. Each cuspidor must contain eight ounces or more of solution of bichloride of mercury of the strength of 1 to 500. These should be emptied, washed in a similar solution and refilled each trip, or once every 24 hours. The floors of the cars should be sprinkled with the same solution before sweeping, and instead of dusting off the seats and windows they should be wiped off with a cloth dampened in the same solution. The cuspidors should be of porce-

lain material or earthen ware." It is also requested that this rule be applied to all the waiting rooms at stations.

London to Paris by Calais.

There are reports that at last the old and primitive method of handling baggage at Calais is to be done away with and a more modern plan adopted. The old plan is to carry each piece of baggage ashore separately by hand. The English lines have already at Dover a conveyor which works satisfactorily at all states of the tide and saves an immense amount of time. It should be possible to make the journey from Paris to London in 6¾ hours, a saving of 35 minutes, without increasing the speed of the English trains.

The report that the turbine steamer "King Edward VII" was to be on the cross channel service is unfounded, and the service is still satisfactorily performed by the side wheel boats of the Northern of France and the South Eastern and Chatham railroads. R. HOPE.

A New Bridge Ferry at Nantes.

With the construction of new quays along the south side of the north branch of the River Loire, at Nantes, France, the building of a bridge at their terminus becomes imperative. The State Railroad has extended its tracks along these quays and is about to build large freight depots on a tract of reclaimed land. It is not possible to build an ordinary bridge for railroad traffic at that point without interfering with navigation, and the buildings on each side of the river are too close to the quays to permit approaches sufficiently high to allow ocean vessels to pass under the bridge, nor would a drawbridge prove practicable on account of the constant passage of small boats. The question has been settled, according to the U. S. Consul, by letting a contract for what may be called a ferry bridge. This bridge, or ferry, will consist of two steel towers, one on each side of the river, connected by a horizontal railway. An inverted steel truck will travel along the rails, and suspended from it by steel cables is a platform, which will constitute the ferry. One part of this platform will be used for transporting railroad cars, wagons, and horses; the other part will be set aside for foot passengers. The ferry, or "nacelle," will be operated by an electric motor mounted on the truck and will travel on a level with the quays. The passage will be made in one minute. The ferry platform will be 40 ft. square and will have a maximum capacity of 60 tons. The bridge, or horizontal rails, supporting the platform will be 487 ft. long and 162 ft. above the water. The entire structure will cost $199,000 and will be completed next year.

The bridge is expected to be a paying investment as well as a great convenience. Thousands of workmen employed in the ship-yards and residing across the river will use it; it will also convey an immense amount of heavy traffic. Foot passengers will be charged 1 cent each; one-horse carts, empty, 5 cents; carts with two horses, 7 cents; one-horse carts, loaded, 8 cents; two-horse carts, loaded, 10 cents; loaded wagons, 12 cents. The last named often weigh from five to seven tons. The work of construction is under the supervision of V. Baudine.

A Strike in Italy.

The Italian Government has adopted stringent measures to prevent the threatened strike on the railroads. The chief of these was to call out one class of the reserves, and as the whole population are soldiers this includes a large majority of the railroad employees, so that instead of the strike being an ordinary strike this causes it to become mutiny should any of the men disobey orders. The men are not very displeased, as they are getting pay both as railroad men and as soldiers. The grievances are chiefly unreasonably long hours of labor and pay insufficient to keep body and soul together. The companies have promised to improve the disputed points, and so far there has been no interruption of the train services and there are few outward signs of the change.

Luxury in the Soudan.

A very luxurious train is running from Wady Halfa to Khartoum on the narrow gage line. The sleeping cars are almost nine feet wide and are carried on bogies; the accommodation is very fine, each traveler having a compartment to himself with a bed, arm chair, and writing table in it. In the morning the train stops about eight o'clock at a station where there are hot and cold baths provided for each passenger. While the bath is being enjoyed attendants enter the cars and clean them up, making the bed and arranging the compartment so that on the return it is clean; there is also a first-class restaurant car attached in which the meals are served in good style. The blinds are dust proof and in each compartment is an electric fan. The only engineering work of any moment on the line is the Atbara bridge, and the engines are powerful and heavy. The speed is about 20 miles per hour, which is pretty good for a narrow gage line.

Railroads in Siam.

Consul-General Hamilton King writes from Bankok under date of Dec. 16, 1901, a short statement of railroad affairs in Siam. The great highways of the country have always been the three splendid rivers which bring the plains of the northern part of the country into direct communication with the sea. Roads, until recently, have been unknown, but about 20 years ago the movement was taken up for streets in Bankok and the city is now well supplied. About 10 years ago the first railroad, known as the Paknam, was opened, owned by a local stock company and under Danish control. It is about 17 miles long, between Bankok and Paknam, at the mouth of the River Menam, at which all vessels stop on the way in and out of Bankok. This road has proved a success from the first, and is now paying about 7 per cent. on the investment. In contrast to this are the railroads which have been built by the Government, one of which, 102 miles long, runs from Bankok to Korat, and another branch from this line 57 miles northeast of Bankok and runs to Lopburi, 26 miles distant. By the most favorable showing possible, these Government lines are paying about 1 per cent., but conservative estimates shows actual loss in the operation. Concessions for two private railroads have also been recently granted to Siamese. During the 10 years of its railroad history, the Government has spent about $8,000,000 in its endeavor to keep its railroads in its own hands. The conservative custom of buying supplies in a closed market is largely responsible for the financial loss. Of this, the producers of America may be assured; whatever its railroad development may be, until a radical change is made Siam's trade in railroad supplies is as effectually closed to the American market as it would be were its ports closed against us.

Ventilating the Central London Railway.

The atmosphere in the "Twopenny Tube" has for many months been getting more and more foul. Not long ago we happened to be in a train which for some reason stopped for some minutes between the stations, and we then noticed that directly the train stopped the air became distressingly oppressive, far more so than anything we have ever experienced from the sulphurous fumes in the Metropolitan or District tunnels. It is evident that the piston-like action of the trains in the tunnels has not ventilated them in the effective manner that it was thought it would do, but has simply driven the air forwards and backwards and created the most appalling draughts in the tortuous subterranean passages. The company has, upon the recommendation of Sir Benjamin Baker, installed an electrically driven fan at Bond Street Station, and after the trains have ceased running for the night the air is exhausted from the tunnels and sent up one of the shafts to the surface. The atmosphere in the tubes will thus be changed every night, and it is to be periodically tested by medical experts, and if it should be found that more fans are required they are to be put in.—*The Railway Engineer.*

A Northern Pacific Irrigation Canal.

President Mellen and Vice-President Lamont, of the Northern Pacific Railway, are President and Vice-President of the Northern Pacific Irrigation Company, incorporated to complete and operate 40 miles of irrigation canal in Yakima County. The railroad's land department thus undertakes irrigation on a large scale as a means of promoting general traffic.

Extra Fares in Russia.

The Russian railroads make an extra charge for passage on express trains. Their speed, except in a few cases, is quite moderate, but it is much greater than that of ordinary passenger trains. It is now announced that the amount of this extra charge will be increased. On the Nicholas Railroad (St. Petersburg-Moscow) it has been 30 per cent. of the regular fare, and is to be 40 per cent. hereafter, and on other routes advances from 15 to 20 per cent., from 20 to 30, from 20 to 40 and from 30 to 50 per cent. The 50 per cent. addition is on an express train between St. Petersburg and Warsaw, 693 miles, and it will cost nearly $6 more to travel on it than on ordinary trains.

LOCOMOTIVE BUILDING.

Alan Wood & Co. are having a locomotive built at the Baldwin Works.

The National Tool Co. is having a locomotive built at the Baldwin Works.

The Tennessee Central is having six engines built at the Manchester Works of the American Locomotive Co.

The Norfolk & Western is having 19 locomotives built at the Baldwin Works. This includes an order reported Feb. 7.

The Denver & Rio Grande is having 30 locomotives built at the Baldwin Works. This includes the order reported in our issue of March 21.

The Sheffield & Tionesta has ordered an engine from the H. K. Porter Works. T. D. Collins, Nebraska, Pa., is President and General Manager of the railroad.

The Cincinnati, Hamilton & Dayton has placed an order with the Pittsburgh Works of the American Locomotive Co. for 10 engines, eight of which are to be freight and two passenger. They are to be 10-wheel and the freight engines will be exact duplicates of the seven received from the same works last February. The passenger engines will be similar to the freight engines in all respects except that the cylinders will be 18 x 26 in., and the drivers 69 in. instead of 57.

The Texas & Pacific order for locomotives with the Cooke Works of the American Locomotive Co., reported April 18, should read: Number, 25, for delivery this summer; to be simple, 10-wheel, weighing 156,000 lbs.; on drivers, 122,000 lbs.; cylinders, 20 x 26 in.; 63-in. drivers; extended wagon-top boilers, radial stay, with a working steam pressure of 200 lbs.; 280 tubes 13 ft. 4 in. long and 2 in. outside diameter; fire-box of carbon steel, 123 x 42 in.; tank capacity, 6,000 gal. of water, 12 tons of coal. The special equipment includes Westinghouse air-brakes; Golmar brake-beams; Tower couplers; Pyle electric headlights; Ohio injectors; U. S. Piston rod and valve packings; Leach sanding devices; Detroit sight-feed lubricators; French springs, and Gold steam heat equipment.

The Colorado & Southern order for 15 heavy consolidation locomotives, reported last December, is as follows: Builder, Richmond Locomotive Works; engines, simple consolidation; total weight, 191,701 lbs.; weight on drivers, 173,051 lbs.; cylinders, 22 x 28 in.; 57 in. drivers; straight boilers with working steam pressure of 210 lbs.; 411 tubes, Tyler make, charcoal iron No. 11; outside diameter 2 in., length 13 ft. 6 in. over sheets; fire-box, 121 x 41¼ in. of carbon steel; tank capacity, 8,000 gal.; coal capacity, 10 tons. The special equipment includes Westinghouse air-brakes, Cambria steel axles, Coffin process; Sterlingworth brake-beams, Streeter brake-shoes; Tower stub, and Westinghouse friction draft Tower couplers; Buck headlights, No. 1,395; Monitor injectors No. 10; Jerome piston and valve-rod packings; Leach sanding devices; Nathan sight-feed lubricators; French springs; Crosby gages; Latrobe driving wheel tires; 50-in. cast steel wheel centers; magnesia lagging, all bearings of Cicero bronze, and Player steel tender truck of Shickle, Harrison & Howard build.

The St. Louis & San Francisco has ordered 28 compound 10-wheel fast freight locomotives from the Baldwin Locomotive Works in addition to those reported in our issue of April 25th, for December, 1902, and January, 1903, delivery. The company has also ordered 25 locomotives from the American Locomotive Works, 10 of which will be ten-wheel simple freight and 15 eight-wheel passenger engines. The freight engines will weigh 153,000 lbs., with 126,000 lbs. on the drivers, and have 20 x 26 in. cylinders and 57 in. drivers, wagon-top boilers, with a working steam-pressure of 200 lbs., 290 charcoal iron tubes, 2 in. in diameter and 12 ft. long, fire-box 108 in. long and 40 in. wide, tender capacity 4,300 gallons of water and 10 tons of coal. The passenger engines will weigh 134,000 lbs. with 90,000 lbs. on the drivers, and have 19 x 26 in. cylinders, 69 in. drivers, extended wagon-top boilers, with a working steam-pressure of 200 lbs., 290 charcoal iron tubes, 2 in. in diameter and 12 ft. long, fire-box 108 in. long and 40 in. wide, tender capacity 4,300 gallons of water and 10 tons of coal. The special equipment for both classes includes Gollmar bell ringers, Sterlingworth brake-beams, Leeds couplers, Ashton safety valves, triple sight-feed lubricators, French springs, McKee-Fuller trucks and tender wheels for passenger engines, and 33 in. chilled plate tender wheels for freight engines, with Davis wheel centers.

CAR BUILDING.

The El Paso & Southwestern has ordered three cabooses from the American Car & Foundry Co.

The Burlington, Cedar Rapids & Northern are having 100 freights built at the Barney & Smith Works.

The Pennsylvania Steel Co. is having 600 freight cars built at the Pressed Steel Works, Allegheny, Pa.

The Boston & Maine is having nine coaches and 32 freight cars built at the Barney & Smith Works.

The Lake Shore & Michigan Southern has ordered 10 passenger coaches from the Barney & Smith Works.

The American Car & Foundry Co. has received orders for 18 freights, three coaches and three cabooses, for export.

The St. Louis, Kansas City & Colorado is having 150 freights built by the Mt. Vernon Car Co. This includes an order previously reported for 25.

The Cincinnati, Hamilton & Dayton is building at its Lima shops 50 40-ft. flat cars of 70,000 lbs. capacity. Arrangements are also being made to build 110 34-ft. 60,000 lbs. side dump coal cars. These cars are all to have wooden bodies, Simplex bolsters, Buckeye couplers and Sterlingworth brake-beams.

The Southern Pacific order for 250 stock cars with the American Car & Foundry Co. is as follows: Capacity, 60,000 lbs.; length, 36 ft.; width, 8 ft. 9 in.; material, wood; steel axles; S. H. & H. steel bolsters; Sterlingworth brake-beams, M. C. B. brasses, Tower couplers, Miner draft rigging, 33 in. wheels and rigid trucks.

The Cincinnati, Hamilton & Dayton order with the American Car & Foundry Co., reported in our issue of April 25, calls for 300 wooden coal cars of 35 tons capacity, August delivery. They will be 36 ft. long over end sills, 8 ft. 11 in. wide and 44½ in. high from top of floor to top of side. The special equipment includes Simplex bolsters, Sterlingworth brake-beams, Westinghouse air-brakes and Buckeye couplers.

The St. Louis & San Francisco has ordered 665 Frisco standard box cars of 60,000 lbs. capacity, 100 40-ft. flat and 170 34-ft. coal cars of 80,000 lbs. capacity, and 25 cabooses from the American Car & Foundry Co., to be built of wood, for May, June and July delivery. The special equipment for all includes Sterlingworth brake-beams, Trojan couplers, Miner draft rigging for the box cars, and American continuous draft rigging for the others, Chicago roofs and Scott springs.

The Cleveland, Cincinnati, Chicago & St. Louis order with the Pullman Co., reported in our issue of March 14, calls for 1,000 freight cars of 60,000 lbs. capacity, July delivery. These cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements. The special equipment includes Pullman steel axles, National Hollow brake-beams, Westinghouse air-brakes, Buckeye couplers, Dunham doors, C. C. C. & St. L. draft rigging, Chicago roofs, class W springs, Diamond trucks and Griffin wheels.

The New York, New Haven & Hartford order for freight cars, reported April 25, should read 300 instead of 200. Builders, Keith Mfg. Co., Sagamore, Mass.; cars to be Pratt coal cars of 60,000 lbs. capacity; weight of car, 29,500 lbs.; length, 36 ft. over end sills; width, 8 ft. outside measurement; height, 4 ft.; to be built of wood. Special equipment includes Pressed Steel Co. bolsters, Kewanee brake-beams, Westinghouse trucks, Tower couplers, Miner draft rigging, McCord journal boxes and journal box lids, French springs, Fox trucks, Barnum, Richardson & Co. wheels, and "gravity" side bearings.

BRIDGE BUILDING.

ADRIAN, MICH.—Frank T. Oakley, Chief Engineer of the Toledo & Western Ry., Toledo, Ohio, writes that he will be ready to receive bids soon for concrete abutments and steel girders for an undergrade crossing of the Wabash by his road.

ALMA, KAN.—The County Clerk has been ordered to advertise for bids for the following bridges: Sixty-five ft. bridge on Rock Creek; 60 ft. bridge on Mill Creek; 40 ft. bridge on Mission Creek; 30 foot bridge in Plumb; all to have 16 ft. roadways.

ALTOONA, PA.—Harvey Linton, City Engineer, writes that the bridge proposed at Seventh street will be a pin connected truss about 168 ft. span. It will be used by the city of Altoona and the City Passenger Ry. Co., and will replace the present old bridge. No date is set on which bids are to be received.

ALVINSTON, ONT.—Tenders will be received until noon on May 6th by A. S. Code, C.E., Alvinston, Ont., for the erection of two wrought iron or steel highway through bridges. Plans and specifications must be furnished by the contractors.

ATLANTA, GA.—We are told that the contract for the Peters street viaduct has been let to Grant Wilkins, of Atlanta, at $70,800; also a contract for some repair work on the Nelson street bridge at $3,500.

BETHLEHEM, PA.—There will be a joint meeting of the Commissioners of Lehigh and Northampton Counties in this city this week for the purpose of considering plans for pushing the completion of the new Monocacy bridge.

BOONVILLE, MO.—The Missouri, Kansas & Texas proposes to build a foothridge at Boonville at a cost of $20,000.

BUFFALO, N. Y.—We are told that the lowest bid on the Ohio street bridge over Clark & Skinner Canal greatly exceeded the Engineer's estimate and has been rejected. It is quite probable that new bids will be wanted by the State Superintendent of Public Works in the near future.

CAIRO, ILL.—It is said that the Illinois Central bridge over the Ohio at Cairo will be double-tracked.

CAMBRIDGE, OHIO.—Bids are wanted until May 7 for a steel bridge, 112 ft. long, across Willis Creek. William P. Dehart, Clerk.

CAMDEN, N. J.—The City Council has passed the ordinance authorizing the Pennsylvania R. R. to elevate its tracks and build bridges at certain streets.

CANTON, OHIO.—The County Commissioners are said to have arranged to build a bridge in Canton across the West Creek on Linden avenue, and want bids for same.

CLARION, PA.—Bids will be received until May 12 at 10 p.m., for building a bridge over Redbank Creek at Hawthorn, between Clarion and Armstrong Counties.

CLARKSBURG, W. VA.—It is reported that the Fairmont

& Clarksburg Electric Ry. is considering building a new bridge extending from Sixth street.

CLEARFIELD, PA.—Viewers estimate that it will cost $15,000 to replace the upper Bloom bridge. The work will be done by the State.

CLEVELAND, OHIO.—Bids are wanted May 14 by the Board of Commissioners of Cuyahoga County for the superstructure of a trestle highway bridge over Cahoon Creek in Dover Township. Plans are on file with County Surveyor Wm. E. Evers, New Court House, Cleveland, Ohio. Julius C. Dorn, Clerk.

COLUMBUS, OHIO.—Plans are being made by Henry Maetzel, County Surveyor, for the two bridges to be built on Cleveland avenue. The County Commissioners will probably order concrete structures.

COPPERSTOWN, N. DAK.—Bids are wanted until May 26, by the County Commissioners, for building a steel bridge across the Sheyenne River to replace the present wooden structure. P. A. Melgard, County Auditor.

The Town Clerk of Copperstown is advertising for bids which will be opened on May 8, for building the masonry work for a bridge between sections 23 and 24.

EL PASO, TEXAS.—We are told that the El Paso & Juarez Traction Co. of El Paso will build the proposed bridge over the Rio Grande at El Paso.

FALL RIVER, MASS.—Bids are being received until May 20 for eliminating the grade crossings on the New York, New Haven & Hartford in Fall River. Bids for the steel work and masonry must be separate.

FLANDREAU, S. DAK.—The County Commissioners are asking bids on two new bridges.

GEORGIA.—A bill was introduced in the U. S. Senate on April 23 authorizing a bridge across the Savannah River from the mainland in Aiken County, S. C., to the mainland in Richmond County, Ga.

GRAND RAPIDS, MICH.—We are told that bids will be wanted about May 5 by G. S. Johnson for the proposed bridge over Grand River at North Park. It will be about 600 ft. long and consist of four through girder spans. The estimated cost is $30,000.

HARRISBURG, PA.—T. L. Eyre, State Superintendent of Public Grounds and Buildings, writes that no bridges have yet been contracted for, nor have the Commissioners finally passed upon any applications to replace bridges that have been destroyed throughout the State by the spring freshets. Two applications are pending before the Board and several are pending in Dauphin County courts in conformity with the act of 1895. It will probably be some time before contracts will be ready to let.

HARTLAND, WIS.—The Village Board has decided to build a concrete arch bridge over Bark River. It will be 66 ft. wide.

HAZLETON, PA.—The viewers appointed to consider the bridge at White Haven have recommended that a new steel bridge be built at a cost of about $38,000. C. W. Kline, of this town, was a member of the board.

HIGH SHOALS, N. C.—It is said that the High Shoals Co., A. Q. Kale, Superintendent, will build a steel bridge about 300 ft. long at this place.

JACKSBORO, TENN.—Wm. M. Keenly, Riley Murray and R. Merideth compose the committee that will receive bids for four steel bridges in Campbell County. W. R. Irish, Deputy Clerk.

KNOX, IND.—Bids are wanted May 5 by the Board of County Commissioners for building several iron bridges. John W. Kurtz, County Auditor.

LAKOTA, N. DAK.—Bids are wanted until May 15, at the office of the County Auditor, for building a bridge over South Fork of Forest River.

LANGHORN, PA.—It is quite probable that the Philadelphia & Reading will build a bridge at the Langhorn crossing.

LORAIN, OHIO.—It is reported that the Nickel Plate will probably build a new bridge across Black River.

LOWELL, MASS.—The City Engineer has received from the City Solicitor an opinion as to the liability of the Locks & Canals Co. in rebuilding the canal bridges in Broadway and East Merrimack street. Otherwise nothing has been done in regard to this matter.

MIDDLETOWN, OHIO.—The County Commissioners have recently inspected the canal bridges between this city and Hamilton, with a view to ascertaining how many bridges it will be necessary to change in order to make the proposed canal improvements.

MISSISSIPPI.—The U. S. Senate on April 24 passed the bill, previously passed by the House of Representatives, authorizing the Mississippi Midland R. R. to build a bridge across the Pearl River. (April 25, p. 313.)

MONTREAL, QUE.—The Senate Railway Committee has adopted the Montreal Bridge Company's bill, changing the name to the Montreal Bridge & Terminal Company. This is the same measure which was thrown out a fortnight ago by the House of Commons Railway Committee, and asks for an extension of the charter which expires in June.

NEW CASTLE, IND.—Bids are wanted May 15 for building several steel bridges. Mark Davis, County Auditor.

NEWKIRK, OKLA. T.—Bids are wanted until May 12 for a steel bridge, also for a wooden bridge. C. V. Harris, County Commissioner; Mills G. Voris, County Clerk.

NORFOLK, VA.—It is stated that the Norfolk, Portsmouth & Newport News R. R. is receiving bids for a bridge across the western branch of Elizabeth River.

PAINESVILLE, OHIO.—We are told that the bridge proposed over the Chagrin River a mile south of its mouth, was voted down at the April election.

PATERSON, N. J.—Bids are wanted 2 p.m. May 3 for the Ackerman avenue bridge. Plans and specifications may be seen at the house of Michael J. Dillon, No. 128 First street, Passaic, N. J., and at the office of the Clerk of the Board of Freeholders of Bergen County, in the Court House at Hackensack, N. J.

PERTH AMBOY, N. J.—Plans have been filed with the Secretary of War for the proposed bridge over the Raritan River between Perth Amboy and South Amboy by the electric railroad company, in which former Governor F. M. Voorhees and Senator John Keen are interested. The bridge will cost about $150,000.

PITTSBURGH, PA.—The footbridge at South Fourth street over the Pittsburgh, Charleston & Virginia tracks was wrecked by a gravel train on April 25.

PORTAGE, PA.—A site has been selected for a new county bridge at Portage.

PORT HURON, MICH.—Bids are wanted May 5 for building the bridge at Seventh street. Contractors to furnish plans, etc. R. D. O'Keefe, Superintendent of Public Works.

REVERE, MASS.—The Commissioners of Middlesex and Suffolk Counties are considering repairing the Revere and Beach street bridges over the Boston, Revere Beach & Lynn R. R.

RUTHERFORDTON, N. C.—It is said bids are wanted May 8 by the County Clerk for a $6,000 bridge over Broad River.

RUTLEDGE, TENN.—The Grainger County Commissioners have voted to build a bridge over Patterson Creek, but we are told nothing further is decided. Address H. Gilmore.

ST. CATHARINES, ONT.—Tenders for the substructure of the bridge to be built over the old Welland Canal at Marlett's Crossing will be received up to May 5. Plans and specifications at the office of the Superintending Engineer Welland Canals, St. Catharines, Ont. Tenders to be sent to L. K. Jones, Sect. Dept. Railways and Canals, Ottawa, Ont.

ST. CHARLES, MO.—Officers of the St. Louis, St. Charles & Western (electric) R. R. visited the site of the proposed bridge over the Missouri River at St. Charles. This contract is let to A. J. Tullock, of Leavenworth, Kan., at $400,000, and Congress has recently extended the time for building until 1904. (March 28, p. 234.)

ST. JOSEPH, ILL.—Bids are wanted, with plans and specifications, by Ira O. Baker, at Champaign, at 1 p.m., May 6, for a steel and stone bridge 105 ft. long over Salt Fork.

ST. JOSEPH, MO.—Four bridges on the Burlington were burned in the vicinity of St. Joseph within three days of April 21.

ST. PAUL, MINN.—The County Surveyor has been ordered by the Board of County Commissioners to make plans and submit estimates of the cost of a steel bridge over Phalen Creek.

SCRANTON, PA.—Director of Public Works, John E. Roche, and representatives of the Delaware, Lackawanna & Western, have practically decided upon plans for a subway at the South Washington avenue crossing. It will be about 800 ft. long and about 50 ft. wide. The estimated cost is $40,000.

A foot-bridge will be built by the railroad company in the block between Meridian street and Seventh and Scranton and Luzerne streets.

SHERBROOKE, N. DAK.—Bids are wanted May 9 for building seven combination bridges. T. S. Hunt, County Auditor.

SPENCER, IND.—The Board of County Commissioners of Owen County will receive bids until May 5 for four iron or steel bridges, varying in lengths from 18 to 40 ft.

SPRINGFIELD, OHIO.—The Council is considering removing the Fountain avenue bridge further up Buck Creek and the City Engineer has been authorized to make plans and report at the next meeting.

STILLWATER, MINN.—The City Council has decided to build a steel bridge over St. Croix River, provided $2,000 additional be raised by public subscription.

STOUFFVILLE, ONT.—Tenders are being received by R. Underhill, Chairman Road and Bridges Committee, Stouffville, Ont., for a culvert bridge to be built in the village of Stouffville.

TOPEKA, KAN.—The question of building a new bridge over Schunganunga Creek on South Kansas avenue is again before the Councils.

VANCOUVER, B. C.—The Cambie street bridge will be repaired at a cost of $6,000.

WAHOO, NEB.—Carl R. Goucher, County Clerk, is advertising for bids for a number of wooden bridges, and also asks plans and specifications and bids on steel spans. The bids are to be opened May 16.

WALKERVILLE, ONT.—We have additional information about the two bridges on the London & Port Stanley Division of the Lake Erie & Detroit River. One will be about one mile south of the city of London and across the Thames River, and be 164 ft. span on masonry abutments and cost $12,500. The other will be about one mile north of Port Stanley across Kettle Creek, and be similar in design and cost to the other structure. The proposed new bridges will replace the present Phœnix truss bridges. Benjamin Douglass, Bridge Engineer, is now making plans for the structures.

WESSON, MISS.—The Board of Supervisors has decided to build a bridge over Pearl River as soon as the site is selected.

WOONSOCKET, R. I.—Bids are wanted May 3 by E. L. Simmons, Chairman of the Streets and Bridge Committee, for the steel and concrete bridge over Cherry Brook. Frank H. Mills, City Engineer.

Other Structures.

ANNISTON, ALA.—It is said that a plant to make frogs and switches will be built in Anniston. The Commercial Club may be able to give information.

AUSTIN, TEXAS.—The contract for building the new passenger station of the Houston & Texas Central at Austin has been let to Fischer & Lambie, of Austin. The cost will be about $25,000.

BAY CITY, MICH.—It is said that plans have been finished for the Pere Marquette station to be built in Bay City, and that estimates will be wanted pretty soon.

BEAUMONT, TEXAS.—We are told that the new shops of the Southern Car Mfg. & Supply Co. are being built by day work. The buildings consist of a storehouse 60 x 165 ft.; machine shop, 70 x 160; foundry, 60 x 80; pattern and storage shop, 30 x 80; blacksmith shop, 40 x 60. The estimated cost is $20,000. J. A. Wiggs, Jr., of Beaumont, is President.

CLEVELAND, OHIO.—Plans, according to report, have practically been decided upon for the new union station to be built at Cleveland by the Lake Shore & Michigan Southern, the Cleveland, Cincinnati, Chicago & St. Louis, and the Pennsylvania. The estimate is about $4,000,000.

A new coke furnace will be built here, the plans of which were made by Carnegie Steel Company's engineers.

DECATUR, IND.—Plans and specifications, according to report, have been made for the Grand Rapids & Indiana passenger station in this city. The contract will probably be let soon. The new station will have a frontage of 290 ft.

EAST ST. LOUIS, ILL.—It is said that the Pittsburgh Reduction Co., which now operates furnaces and rolling mills at New Kensington, Pa., and Niagara Falls, N. Y., will remove eight furnaces to a new site near East St. Louis, where ground has already been bought.

FALL RIVER, MASS.—The New York, New Haven & Hartford will probably let contracts in the near future for changes to the station in this city in connection with the elevation of tracks.

FORT WADSWORTH, N. Y.—Proposals are wanted until noon of May 7 for building an ordnance repair shop. E. C. Pierce, Q. M.

GRAND RAPIDS, MICH.—The Pere Marquette has, according to report, decided to consolidate all its repair shops at a point about two miles south of this city where new buildings are to be erected. At present the company has shops at Detroit, Saginaw, Muskegon, Ionia and in Grand Rapids. Each of these will be consolidated in the new works, which will cost about $200,000.

LIMA, OHIO.—We are told that plans have not yet been decided upon by the Western Ohio Ry. for the car barns, repair and paint shops that are to be built by this company.

MONTREAL, QUE.—It is said that the plans for the Canadian Pacific new shops at Hochelaga provide for the use of electricity, both for power and lighting purposes. The plans provide for about 15 or 16 buildings, but are not yet far enough advanced to state when work will be begun.

NEWARK, N. J.—Work has been begun on grading for the new shops to be built by the International Steam Pump Co. in Harrison, where the company has 30 acres of ground. When the new buildings, which will cost about $500,000, are finished, the works now located at Brooklyn and at Elizabeth will be removed to the new works. Contracts for machinery are understood to have not been placed yet.

NEW YORK, N. Y.—The Pennsylvania R. R. has appointed Messrs. McKim, Mead & White, of New York, architects for the new terminal station which the company will build in this city. With its approaches the station building will extend over four blocks, covering the area from east of Seventh avenue to west of Ninth avenue and from Thirtieth to Thirty-fourth streets.

PINE BLUFF, ARK.—The Iron Mountain and Cotton Belt Railroads are said to be considering plans for a union station in Pine Bluff.

PITTSBURGH, PA.—Plans have been made by the Carnegie Steel Company for two new furnaces to be erected at the Edgar Thomson plant in Braddock. The plans call for furnaces with 90-ft. stacks, each having a daily capacity of 800 tons.

The Rolled Steel Casting Co., a new concern recently organized, has bought 20 acres of ground at Tarentum, where a steel casting plant will be built. It is said the main building will be 340 x 140 ft. C. C. Smith, President of the Union Steel Casting Co., and S. H. Church, Assistant Secretary of the Pennsylvania Lines, are interested.

PORTLAND, ORE.—The Southern Pacific Co. will soon begin work on the new boiler and store and office buildings on East Twenty-first street. As previously mentioned, this contract has been let and it is said the cost of the improvements will be about $75,000. All the buildings will be of brick. The boiler and blacksmith shop will be 123 x 173 ft.

PROVIDENCE, R. I.—Plans for the new station at the corner of India and South Main streets for the New York, New Haven & Hartford are finished.

ST. JOSEPH, MO.—A large coaling plant will be built by the Chicago Great Western in its yards near Highland avenue The structure will be 16 ft. wide and about 700 ft. long.

WAUKESHA, WIS.—The Modern Steel Structural Co. has begun work on its proposed new building, which will be 145 x 160 ft., entirely covered by traveling crane.

WINNIPEG, MAN.—It is said that plans are being considered by the Canadian Pacific for extensive improvements to the shops at Winnipeg, and that the expenditure will reach about $50,000.

YOUNGSTOWN, OHIO.—The Youngstown Mfg. Co. will build a rolling mill at Struthers, adjoining its nut and bolt works. S. V. Huber & Co., Pittsburgh, are the engineers.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xviii.)

Rocky Mountain Railway Club.

At the meeting on April 19 the papers discussed were: "The Educational Requirements of the Large Locomotive." Author, F. P. Roesch. (See February proceedings); discussion of the Report of the Committee on the Revision of M. C. B. Rules. (See March proceedings); "The Effect of All Flanged Driving Wheel Tires on the Engine." Author, J. W. Hardy. (See March proceedings.)

St. Louis Railway Club.

Through the courtesy of Mr. Howard Elliott, Second Vice-President of the Chicago, Burlington & Quincy, the next regular meeting of this club will be held at Hannibal, Mo. Members and their families are invited to attend and afterward inspect the new shop plant of the Burlington at that point. A special train will leave the St. Louis Union Station at 9 o'clock a.m., Friday May 9; returning it will arrive at the Union Station at 6:30 p.m. An opportunity will be afforded the party to inspect the celebrated Bellefontaine bridge on the return trip.

Engineers' Club of Philadelphia.

A regular meeting of the Club will be held on Saturday, May 3, at 8 o'clock p.m. The paper will be on "Aerial Cable Transportation," illustrated. By William Hewitt.

On April 19, Mr. James Christie presented the communication of the evening upon "Modern Developments in the Production of Open-Hearth Steel," and illustrated

his descriptions by a series of photographs and drawings reproduced by means of the lantern. A discussion followed, which was participated in by Messrs. Benjamin Talbot, William R. Webster, Henry J. Hartley, Francis Schumann, Wm. Copeland Furber, John Birkinbine, and T. W. Jenks.

Association of American Steel Manufacturers.

The annual meet of this association, which is devoted entirely to questions of testing and the standardization of specifications for steel, was held at Pittsburgh, on April 19. Committees were appointed to carry on the work of further standardizing the various classes of material made by the iron and steel plants of the country and the details of the standardizing of structural shapes will be further worked out. Secretary Albert Ladd Colby, of Bethlehem, Pa., announced that the standards prepared by the American committee of the International Association for Testing Materials are now being generally adopted by the trade. Officers were elected as follows: President, A. F. Huston, President of the Lukens Iron & Steel Co., Coatesville, Pa.; Vice-President, John McLeod, Assistant to the President of the Carnegie Steel Co., American Steel Hoop Co. and the National Steel Co.; Secretary and Treasurer, Albert Ladd Colby, Metallurgical Engineer of the Bethlehem Steel Co., South Bethlehem, Pa. The following concerns were represented: American Steel & Wire Co., Chicago, Ill.; American Steel Hoop Co., Pittsburgh; Bethlehem Steel Co., South Bethlehem, Pa.; Carnegie Steel Co., Pittsburgh; Central Iron & Steel Co., Harrisburg, Pa.; Crucible Steel Co. of America, Pittsburgh; Illinois Steel Co., Chicago; Jones & Laughlins, Ltd., Pittsburgh; Lukens Iron & Steel Co., Coatesville, Pa.; Maryland Steel Co., Sparrows Point, Md.; National Steel Co., Pittsburgh; National Tube Co., Pittsburgh; Pennsylvania Steel Co., Steelton, Pa.

American Society of Mechanical Engineers.

Following is the list of papers to be presented at the Boston meeting, May 27: "Proposed Standard for Machine Screw Thread Sizes," by Chas. C. Tyler, Pittsburgh; "A Method of Determining Temperature of Exhaust Gases in Combustion Engines," by R. H. Fernald, New York; "Working Details of a Gas Engine Test," by R. H. Fernald, New York; "Liquid Fuel Combustion," by C. E. Lucke, New York; "Mechanical Stokers for Locomotives," by F. H. Colvin, New York; "The Flying Shear," by V. E. Edwards, Worcester, Mass.; "A Swiveling Joint for a 16-in. High-Pressure Steam Main," by R. E. Curtis, Boston; "Improved Indicator Cock for Engines," by A. K. Mansfield, Salem, Ohio; "A Die for the Cold Working of Sheet Metals," by J. D. Riggs, Pittsburgh, Pa.; "Repairing a Broken Cylinder," by H. M. Lane, Scranton, Pa.; "Electricity in Cotton Mills," by W. B. S. Whaley, Boston; "Recent Construction at the Atlantic Avenue Station of the Edison Electric Illuminating Co. of Boston," by I. E. Moultrop and R. E. Curtis, Boston; "A Roller Extensometer," by G. C. Henning, New York; "Elevator Safeties," by C. R. Pratt, Newark, N. J.; "Technical Index and File," by R. H. Soule, New York; "Specifications for Steel Forgings, Steel Castings and Steel Boiler Plates," by W. R. Webster, Philadelphia, Pa.; "The Lowell Gas Light Company's Coal Pocket," by F. M. Bowman, Pittsburgh, Pa.; "Some Details of Direct-Connected Generator Sets," by Wm. H. Bryan, St. Louis, Mo.; "Tests on Steam Pipe Coverings," by Geo. H. Barrus, Boston. In addition two committee reports will be presented: the supplementary report of the Committee on Standard Pipe Unions, and the final report of the committee appointed to codify and standardize the Methods of Making Engine Tests. Prof. F. R. Hutton, 12 West 31st street, New York, is Secretary.

PERSONAL.

—Naval Constructor Lawrence Spear, U. S. N., has resigned to engage in private business. Mr. Spear was appointed from Ohio in 1886, and graduated from the U. S. Naval Academy at the head of his class, after which he took a course in naval architecture at the Royal School, at Greenwich, England. He has been on duty at the New York Navy Yard since 1899.

—Mr. Charles R. Fitch, whose resignation as General Manager of the Erie has just been announced, had jurisdiction over the entire system. Mr. Fitch's railroad career dates from 1866. After occupying various subordinate positions he was appointed Assistant Superintendent of the Long Island. From this company he went in 1888 to the New York, Pennsylvania & Ohio as Division Superintendent. In November of the same year he returned to the Long Island, but soon went back to the Erie as Superintendent, and from 1892 to 1900 was General Superintendent. Mr. Fitch was made General Manager on Jan. 8, 1900.

—At a meeting of the Board of Managers of the Delaware, Lackawanna & Western, on April 25, Mr. B. D. Caldwell was elected Vice-President, in charge of the traffic department, of which he has been the head with the title, heretofore, of Traffic Manager. Mr. Caldwell has been connected with this company since 1899, when he came to it from the Western Passenger Association, of which he was chairman Mr. Caldwell is a native of California, where he was born in 1858. He entered railroad service in 1875 as a clerk, and his advancement has been rapid. For several years he was chief clerk to the General Passenger Agent of the Vandalia Line, and from 1886 to 1888 he discharged similar duties on the Missouri Pacific. In the last-named year (1888) he was made Assistant General Passenger Agent of that road. Mr. Caldwell was Chairman of the Western Passenger Association for seven years.

—The new Superintendent of the Pacific Division of the Northern Pacific, Mr. Newman Kline, is 43 years old. He was born in Adrian, Mich. His railroad service dates from 1874, when he began as a telegrapher for the Lake Shore & Michigan Southern at Brimfield, Ind. He was made chief clerk to the Assistant General Manager of the Northern Pacific, later becoming Assistant Superintendent of Transportation and then Assistant to the General Manager. In 1898 he was transferred from the Seattle Division to the Yellowstone Division as Superintendent, and assumed the Superintendency of the Pacific Division the 15th of last month.

—Mr. John C. Wilson, the retired Real Estate Agent of the Pennsylvania Railroad, has been connected with the company for about 39 years. Mr. Wilson's retirement took effect yesterday, May 1. He was born at Washington, Pa., in 1832. After graduating from Washington College he entered the service of the Hempfield Railroad as an axman and was promoted through the various positions until he became Assistant Engineer in charge of construction. In December, 1857, he became Principal Assistant Engineer of the Virginia & Kentucky. Three years later (1860) he was employed by the United States Commission in the exploration for a railroad route across the Isthmus of Chiriqui. Mr. Wilson entered the service of the Pennsylvania in 1862 as an Assistant Engineer, and continued in the engineering department until the creation in 1884 of the position which he held at the time of his retirement.

ELECTIONS AND APPOINTMENTS.

Chicago, Rock Island & Pacific.—C. A. Seley, heretofore Mechanical Engineer of the Norfolk & Western, has been appointed Mechanical Engineer of the C., R. I. & P., effective May 1.

Cincinnati, Hamilton & Dayton.—On and after May 1, the Main Line from Cincinnati to Toledo will be operated in two Divisions, to be known as the Southern and Northern Divisions. The Southern Division will extend from Cincinnati to South Lima, including the C. & D. Branch, the Home Avenue R. R. and all yards at Dayton, with J. A. Gordon in charge. The Northern Division will extend from South Lima to Toledo, including the Toledo, Bowling Green & North Baltimore and the Columbus, Findlay & Northern Railroads, with S. B. Floeter in charge, with headquarters at Lima, Ohio. Mr. Floeter has also been appointed Superintendent of the Findlay, Ft. Wayne & Western, succeeding B. W. Fenton, resigned. C. E. Vorhis has been appointed Superintendent of the Wellston Division, at Wellston, Ohio, succeeding Mr. Gordon. W. C. Shoemaker succeeds A. Galloway, resigned, as Superintendent of the Cincinnati, Hamilton & Indianapolis, with headquarters at Connersville, Ind. The position of Assistant Superintendent has been abolished.

Delaware, Lackawanna & Western.—On April 25, E. E. Loomis and B. D. Caldwell were elected Vice-Presidents. Mr. Loomis to be in charge of the coal department and Mr. Caldwell in charge of traffic department.

Erie.—C. R. Fitch, General Manager, with headquarters at New York City, has resigned.

Findlay, Fort Wayne & Western.—See Cincinnati, Hamilton & Dayton.

Great Northern.—Frank Bell has been appointed Assistant Superintendent of the Dakota Division, with headquarters at Larimore, N. Dak., succeeding W. H. Hill, resigned.

John A. Sargent, Assistant General Freight Agent, with headquarters at St. Paul, Minn., has resigned.

Houston & Texas Central.—C. B. Seger has been appointed Auditor, succeeding George Kidd, resigned.

Illinois Central.—Effective the first of April the office of Superintendent of Transportation was created. This is designed to give some relief to the office of General Superintendent of Transportation, and that officer will, in turn, take over some of the duties of the Assistant General Manager. The General Superintendent of Transportation reports to the Assistant General Manager, and he has "general charge of train and station service," and he is "responsible for the safe, prompt and economical movement of passenger and freight trains, and for the proper discipline of employees." He assumes duties that are not ordinarily performed by the Superintendent of Transportation; but he still retains responsibility for the ordinary duties of the latter department. The Superintendent of Transportation, however, takes up the details of distribution of equipment, which are generally performed by that office. He reports to and receives his instructions from the General Superintendent of Transportation, but "his ordinary channel of official communication is through the Superintendents."

Iowa Central.—A. B. Cutts, heretofore General Passenger Agent of the Minneapolis & St. Louis, has been appointed General Passenger Agent of the I. C., with headquarters at Minneapolis, succeeding Geo. S. Batty, resigned, effective May 1.

Louisville & Nashville.—Daniel Breck, Division Superintendent, with headquarters at Louisville, Ky., has resigned.

Maine Central.—M. F. Dunn has been appointed Acting Superintendent of the Eastern Division, with headquarters at Bangor, Me., succeeding A. A. White, resigned, effective May 1.

Manistique, Marquette & Northern.—B. A. Metheany has been appointed General Manager, with headquarters at Manistique, Mich.

Mexican International.—L. J. Spence has been appointed General Eastern Freight Agent at New York City, and L. H. Nutting becomes General Eastern Passenger Agent at New York City. Both to succeed Edwin Hawley, General Eastern Agent, resigned.

Mexican National.—The Directors of this company are as follows: William G. Raoul (President), F. B. Drake, Martin Erdmann, E. H. Harriman, George J. Gould, W. B. Leeds, L. F. Loree, Gordon Macdonald, Henry W. Taft, Felix W. Warburg, E. N. Brown, William Landa 'y Escaudon, Gabriel Morton and Emilio Velasco.

Norfolk & Western.—The offices of the President, F. J. Kimball, and the Secretary, A. J. Hemphill, have been removed to Philadelphia, Pa., effective May 1. C. A. Seley, Mechanical Engineer, has resigned. (See Chicago, Rock Island & Pacific.)

Pennsylvania.—The following changes have been made among the Superintendents: S. C. Long, now Superintendent of the Bedford Division, to be Superintendent of the River and Low Grade Divisions, succeeding C. B. Price, resigned. George B. Beale, promoted to the Superintendency of the Bedford Division, succeeding Mr. Long; W. B. McCaleb, Superintendent of the Sunbury and Lewistown Division, becomes Superintendent of the Middle Division, succeeding Wilson Brown, who has been assigned to special duties in the Transportation Department, and L. W. Allibone, Superintendent of the Cambria and Clearfield Division, succeeds Mr. McCaleb. B. W. Carskaddon, heretofore Assistant Real Estate Agent, has been appointed Real Estate Agent, succeeding John C. Wilson, retired on pension.

Queen & Crescent.—J. H. Murphy has been appointed Master Mechanic of the Cincinnati Division of the Cincinnati, New Orleans & Texas Pacific, with headquarters at Ludlow, Ky.

Rutland.—P. W. Clement, President, with headquarters at Rutland, Vt., has resigned.

St. Louis & San Francisco.—We are informed that there is no foundation for the reports that Mr. Wambaugh has been appointed Chief Engineer.

Seaboard Air Line.—J. L. Adams has been appointed General Eastern Agent at New York City.

Southern Pacific.—R. H. Ingram has been appointed Division Superintendent, with headquarters at Los Angeles, Cal.

Tennessee Central.—The position of General Freight and Passenger Agent has been abolished, and all matters relating to this department will, in the future, be handled by E. H. Hinton, Traffic Manager.

Vandalia Line.—R. K. Rochester has been appointed Engineer of Maintenance of Way, with headquarters at Terre Haute, Ind., succeeding V. K. Hendricks, resigned.

Virginia & Southwestern.—C. O. Parker has been appointed Engineer Maintenance of Way, succeeding F. R. Barrett, resigned. Mr. Parker also succeeds Mr. Johnson as Superintendent, effective May 1.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—An officer writes that preliminary surveys are being made across New Mexico from a point near Portales to Sabinal on the Rio Grande. These surveys have just been commenced and the maximum grades and curves have not yet been ascertained. The company has no immediate intention of building this line but is making the surveys to secure advance information. (Construction Supplement, March 14, 1902.)

ATLANTIC & BIRMINGHAM.—An officer sends the following information about the proposed Birmingham extension which the company, formerly the Waycross Air Line, has in project. Starting at Cordele, Ga., surveys have at present been made as far as Montezuma, 31 miles distant, through Vienna and Byromville, and five miles of grading have been completed. There are now 500 men at work. The maximum grade is 1 per cent.; maximum curve, 4 per cent. There are four important trestles on the line, at Pennahatchie, Turkey and Buffalo creeks, and at Spring Branch. Four locomotives, one train of passenger cars and 36 miles of rail have been ordered. Surveys beyond Montezuma, in the direction of Birmingham, have also been made, but nothing further has been done, as yet.

ATLANTIC CITY R. R. (PHILADELPHIA & READING).—According to the recent ordinances passed by the Camden Council which provide for the elevation of the tracks of the Pennsylvania, the Atlantic City R. R. is also required to depress its tracks at Bulson street 5 ft. It is said that the plans of the company are to depress the tracks 7 ft., to alter the curve between Bulson street and Third street, and to depress and bridge the tracks at Jackson street.

BRITISH COLUMBIA ROADS.—An offer has been made by the Ollala Mining & Smelting Co., New York, to build a railroad from the British Columbia coast to the International boundary, if a subsidy of $4,000 a mile from the province, and $6,000 from the Dominion Government be allowed without land grant.

CANADIAN PACIFIC.—At a recent session of the Dominion House a bill was passed giving the company power to build a railroad from Piles Junction, on the line of the North Shore R. R., running northwest to Shawenegan Falls and Grand Mere; that part of the bill also asking for power to use a land grant for purposes of mining and smelting operations, etc. This clause, however, was refused by the Government. The length of this proposed line is about 22 miles.

Bids will be received until May 10 at the office of W. F. Tye, Montreal, Chief Engineer of Construction, for work required in the reduction of grades on the Ontario & Quebec Division between Smith's Falls and Toronto, Ont. This includes clearing, grading, masonry, bridging and track laying. Specifications and forms of tender will be furnished on application. This portion of the line is 210 miles long.

CANE BELT.—According to reports, a short branch line is to be built by this company in Colorado County, Texas, from a point on the main line near Eagle Lake, to a new town known as Garwood, which is about 20 miles south of Columbus, Texas. The country reached is very fertile and contains rice among other crops.

CATAWBA VALLEY RY. & MINING.—An officer writes that the route of this projected line in Virginia is from Roanoke to Salem, and thence north to the Brush Mountains, through Miller's Gap, east of Craig Creek, to New Castle, Va. The road is intended chiefly to develop the Brush Mountain coal field, and the company controls 40,000 acres of land. Louis A. Scholz, Roanoke, Va., is President. Nothing has been done yet. (April 11, p. 277.)

CENTRAL ARIZONA.—President Roosevelt on April 24 vetoed a bill granting this company right of way through the San Francisco Forest Reserves on the ground that the Secretary of the Interior and Commissioner of the General Land Office consider that the bill does not properly safeguard the Government from destruction of property in the Reserve. (March 28, p. 235.)

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—On May 1 a short extension of what is known as the Elmore

Branch in Wisconsin was opened to Weston in Dunn County. Two passenger trains a day are now run in each direction, and the regular freight schedule of the branch is applied to the extension.

Gaspe & Western.—A bill to incorporate this projected road in Quebec was again introduced April 25, and discussed by the railroad committee of the Dominion House. The company asked powers to build from Fraserville, Que., on the line of the Intercolonial, to Metapedia. The distance between these points by the existing route is 176 miles. The proposed route is only 116 miles. The company also asked privilege to build from Paspebiac to Gaspé Basin, on the Gulf of St. Lawrence. Incorporators are Alexander Colby, New York; Walter Barwick, of Toronto, and others. (Construction Supplement, March 14, 1902.)

Hidalgo Northern.—It is announced that arrangements have been completed by which this property in Mexico will be taken over by the Mexican Central for $900,000 gold, and will be extended to the port of Tampico, thereby affording a new direct route between the City of Mexico and that port.

Hudson Valley (Electric.)—Surveys are reported on the right of way for the proposed extension between South Glens Falls, N. Y., and Saratoga, which it is planned to eventually continue to Schenectady. Rails are ordered for the first part of this extension as far as Saratoga, and it is hoped that they can be delivered in July.

Interborough Rapid Transit (New York).—This company, which is to operate the Rapid Transit R. R., filed articles of incorporation at a meeting of the Rapid Transit Board April 24. The capital is given as $25,000,000, and the purpose of existence the operation of a railroad system in the Boroughs of Manhattan, Bronx, Brooklyn and Queens. Some opposition was made to ratification on the ground that the Borough of Richmond should also be included in such a rapid transit project.

Kansas City & Lexington Electric.—This company was incorporated April 22, in Missouri, to build an electric road between the points named, a distance of 42 miles. Incorporators are James C. McGrew, E. M. Taubman and others, of Lexington.

Kansas City, Mexico & Orient.—Official announcement has just been made by the Mexican Government that the concession which was granted about a year ago to A. E. Stilwell, of Kansas City, and his associates, for building a railroad from Durango, Mex., to Gutierrez, on the Mexican Central, has been forfeited owing to the failure of the concessionaires to comply with the terms under which the concession was granted. It is understood that the forfeiting of this specific concession will have no effect on the general plans of the company.

Long Island.—Surveys are reported for an extension of the Port Jefferson branch from Wading River to Good Ground, 18 miles. It is thought that this extension will be built this year.

Manitoba & Keewatin.—Bill for this company's incorporation to build from Winnipeg northeasterly through Manitoba to its eastern boundary, and thence through the District of Keewatin to tidewater, at the mouth of the River Severn, with branches, was passed by the Dominion Government at its recent session. (Construction Supplement, March 14, 1902.)

Manitoulin & North Shore.—Bids are asked for four sections of this proposed line in Ontario; (1) from the town of Meaford to the city of Owen Sound; (2) from the town of Wiarton to Tobermory Harbor; (3) from Whitefish Bay to a junction with the Canadian Pacific; (4) from Sudbury to Lake Wahnapitae. Plans and specifications may be seen at the company's office in Sault Ste. Marie. T. J. Kennedy is General Superintendent. (April 11, p. 278.)

Medicine Hat & Northern Alberta.—Incorporation has been granted this company, which proposes to build a railroad from Medicine Hat, in the Province of Alberta, N. W. T., to Victoria, on the North Saskatchewan River. The road will, if built, parallel the Calgary & Edmondton for 250 miles at a distance of 50 miles. The bill was passed by the House but the bonding power was reduced to $15,000 a mile. This is the same project for which application was previously made under the name of Medicine Hat & Victoria. (Construction Supplement, March 14, 1902.)

Michigan Central.—Work is reported begun on the double-tracking of this line between Albion and Marshall, Mich., 12 miles. W. B. Finch & Co., Detroit, Mich., are the contractors, and they have 200 men at work on the job.

Midland-New York.—It is proposed to build a steam railroad with the above name from Sonora Station, Steuben County, N. Y., through Sarona, Sonora and Bradford, Steuben County; the townships of Orange and Tyrone, Schuyler County, and Wayne, Steuben County, to the shore of Lake Keuka, a distance of 19½ miles. Frederick F. Culver, 137 Broadway, New York; Archibald S. White, 26 Broadway; Louis R. Morris, 155 West 58th street, New York, and others are directors. Incorporation was granted April 26.

Midland (W. Va.)—Work is reported begun on this projected line in West Virginia which is to extend from Leiter, on the Roaring Creek & Charleston, near Elkins, to Burnsville, on the Baltimore & Ohio, 38 miles distant.

New York & Mohawk Valley.—A certificate of incorporation was filed at Albany April 28 for a steam railroad to run from the village of Fort Plain, Montgomery County, N. Y., to Cooperstown, Otsego County, a distance of 30 miles. The office is at 115 Broadway, New York, and the directors are Geo. W. Nock, 115 Broadway; Robert E. Farley, White Plains, N. Y.; Wm. J. Patterson, 7 Wall Street, New York, and others.

New York, New Haven & Hartford.—Bids are asked on or before May 20 for the abolition of grade crossings in Fall River, Mass. Surveys have already been made for the work, and it is expected that it will begin at once.

North Colchester.—Surveys are reported in Nova Scotia for a line between Truro and the North Shore, with the above title. E. L. Haskett Smith, of Truro, is the engineer in charge.

Novinger Southern.—A company with this name has been incorporated in Missouri, with a capital stock of $100,000, to build a railroad 28 miles long from a connection with the Omaha, Quincy & Kansas City line at or near Novinger, Adair County, southwest to Pure Air in the same county. The incorporators are W. G. Grimson, of Chicago; L. Underwood, of Kansas City, and others.

Orange & Northwestern.—It is reported from official sources that this road, recently completed between Orange and Buena, Texas, 35 miles, is to be extended at once to Lufkin, which is about 100 miles north of Buena. L. Miller, Orange, Texas, is President. (Construction Supplement, March 14, 1902.)

Ontario Roads.—Work is reported in progress on a new lumber road in Ontario which is being built by the Whitney Lumber Co., from Whitney Station to Big Opeongo Lake, 15 miles. One hundred and twenty-five men are reported at work and there is a demand for more. It is thought that the line will be completed by July. Thomas McLaughlin, of Ottawa, is the contractor.

Oregon & Southeastern.—This is the correct name of the company erroneously reported last week as the Oregon & Southwestern. Further particulars show that the date of incorporation was April 18, with general office address 15 James Place, Jersey City, N. J. The line which it is proposed to build runs from Cottage Grove, Lane County, Ore., to the Champion quartz mill 34 miles distant. Kenneth K. McLaren, Horace D. Gould and Evan J. Dudley, of Jersey City, N. J., are the incorporators. (April 25, p. 316.)

Oregon R. R. & Navigation.—It is said that work will be resumed at once on ballasting through the Blue Mountains in Oregon, and that 100 miles of road will be thus improved this year between Huron, where the work stopped last fall, to Encina. The ballasting is being done with gravel and new rails are being laid.

Pennsylvania.—Plans were presented to the Camden, N. J., Council April 24 for the separation of grades throughout this city. The work will remove every grade crossing within the city limits, will require three years for its completion and cost somewhat over $2,000,000, the expense to be borne entirely by the company. An ordinance granting the necessary rights has been introduced in the Council.

Philadelphia & Reading.—Work was reported commenced April 23 at Roan Junction, Pa., for the extension which is to be built between Hazleton and Tamaqua, 12 miles. It is thought it will be completed by Aug. 1.

Plant System.—Announcement is made that on May 1 the recently completed portion of the Savannah, Florida & Western between Jesup and Folkston, Ga., 53.4 miles, will be opened for business. The operating division under jurisdiction of Superintendent W. H. Wright, will be extended over this new line as far as Folkston. (Construction Supplement, March 14, 1902.)

Rio Grande, Pueblo & Southern.—Articles of incorporation were filed in Colorado April 22 by a company proposing to build a railroad about 65 miles long from Pueblo to Walsenburg, Colo. Incorporators, Chas. W. Waterman, Wm. W. Field and others of Denver, Colo., claim that they are not connected with the Denver & Rio Grande or Colorado Fuel & Iron Companies.

Rio Grande Western.—Bids are asked for the first 20 miles of the Salina cut-off, which runs from Farnham, 11 miles east of Price, on the main line, southwest 116 miles to Salina. From Farnham the cut-off runs southwest through Castle Valley, crossing Huntington and Cottonwood Creeks, running along Terren Creek for a short distance and then crossing it and leaving it at Fenton. It then continues southwest across two other small creeks and swings nearly west over into Salina Canyon and thence to Salina. The cut-off will have a maximum grade of 2.5 per cent. in place of the present 4 per cent. grades of Soldiers Summit. The work also involves five tunnels, the longest one of which will be 2,000 ft.

St. Louis & San Francisco.—Rights of way are now reported secured for the projected extension from Blackwell, Okla. T., to Coffeyville, Kan., a distance of about 200 miles. It is said that work will be begun at once.

Trains are now being run over the extension from Vernon, Texas, to Gosnell, Okla. T., 25 miles.

St. Louis Southwestern.—An officer writes, in reference to the projected extension between Lufkin, Texas, and Orange, that the route has been in contemplation for a long time and several examinations have been made, but no definite location surveys. (April 18, p. 296.)

San Diego Eastern.—Further particulars regarding this projected line from San Diego to Yuma, Ariz., indicate that the line will follow the Colorado River eastward to Fort Yuma from San Diego, crossing at Ft. Yuma into Arizona. The grade at no place exceeds 74 ft. to the mile and for the majority of the distance the heaviest grade is 35 ft. For the first 30 miles out of San Diego the maximum gradient is 53 ft.; for the next 90 miles 74 ft., and for the remainder of the route across the desert country 40 ft. The cost of the work will be very light and few bridges and culverts will be required. East of Jacumba, however, there will be a tunnel some 1,600 ft. long where the line emerges into the Carriso canyon. (April 11, p. 278.)

Seaboard Air Line.—Ballasting by eight ballast trains is reported between Norfolk, Va., and Atlanta, Ga. The material used is a mixture of rock, sand and clay, which becomes very compact upon pressure, and a large amount of the line is to be improved in this way.

Sierra (Yucatan).—A concession has been given Antonio Bulnes, of Merida, Yucatan, Mexico, to build an extensive system of railroads on the Yucatan Peninsula to be known as the Sierra R. R. The main line is to run for Merida to Pichucalco, in the State of Chiapas, with branch lines to the agricultural districts of Muscapan and Juarez. A deposit of $25,000 has been made with the Government as a guarantee of good faith.

Sioux City & North Nebraska.—This company filed articles of incorporation April 22 in Nebraska. It is proposed to build a railroad from coal fields near Jackson, Neb., to Sioux City, Iowa, a distance of about 12 miles. The incorporators are W. U. Peterson, John A. Arensdorf and others of Sioux City, and Frank Peterson, of Omaha. It is not stated how the Missouri is to be crossed.

Southern Pacific.—An amendment to the charter of the Caney Valley line was filed at Austin, Texas, April 18, in accordance with the vote of the stockholders April 16, providing for an extension from Van Vleck, Texas, 20 miles long into Wharton County. An extension 40 miles long to run southwest by way of Bay City and across the Colorado River into Matagorda County, was also approved by the Attorney General. (April 25, p. 316.)

Topeka, Lawrence & Kansas City Electric.—A charter has been issued to this company in Oklahoma to exist for 20 years, establishing rights for a railroad from Topeka and Kansas City, Kan., and Kansas City, Mo., by way of Lawrence, Kan. The estimated length of the road is 75 miles and the capital stock is $2,000,000. J. B. Adams and H. M. Levan, of Independence, Kan., and M. L. Adams, of Oklahoma City, Okla. T., are interested.

Union (New York).—Contracts have been given out for 20 miles of the new lines to be built by this electric road in the Borough of Bronx covering a large number of streets there. Forty miles of track have also been ordered and the rails to a large extent already delivered. The necessary cars and other equipment have been purchased. When the present lines are completed, the Union System will have three parallel lines extending from the north line of the city through the park system, Van Cortlandt Park, Bronx Park, the Botanical and Zoological Gardens and the smaller parks, so that it is stated by the President that no point south of Van Cortlandt Park, between the Harlem and the Bronx, will be over two long city blocks from a line of the Union R. R.

Westinghouse Company.—Arrangements are said to have been made with the Pennsylvania by which a railroad will be built from East Pittsburgh to the new Westinghouse foundries to be located at Stewart, several miles east. The road is designed for the exclusive use of the Westinghouse Co.

West Shore (New York Central & Hudson River).—The Drake & Stratton Co., railroad contractors, 100 Broadway, New York, have secured a large contract from this company to build a tunnel near Fort Montgomery, Orange County, N. Y.

GENERAL RAILROAD NEWS.

Atlantic Coast.—The stockholders will vote on May 12 on the proposed consolidation of this property with the Plant System.

Barberton Belt.—This property, which extends around the town of Barberton, Ohio, with an extension to Fairlawn, a total of about 25 miles of track operated, has been purchased jointly by the Pennsylvania, the Baltimore & Ohio and the Erie. It has been previously used by these companies as a terminal for the interchange of cars, at a special car rate.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, offer $24,000,000 4 per cent. gold bonds, dated May 1, 1902, series A to P inclusive. One million five hundred thousand dollars of principal is payable May 1, 1903, and $1,500,000 annually thereafter until 1918. The entire issue outstanding, but not any part of such issue, may be redeemed at the option of the company at 101½ per cent. and accrued interest, on any interest date, upon 60 days' previous notice. The bonds are a direct absolute obligation for the Chicago, Rock Island & Pacific, and the mortgage is limited to an aggregate principal amount of $24,000,000.

Cincinnati & Indiana Western.—Shareholders of the company which was incorporated in Ohio Feb. 28, to build from Cincinnati to Cottage Grove, Ind., to afford an entrance into Cincinnati for the Cincinnati, Richmond & Muncie road, will vote May 22 on an increase of common stock from $500,000 to $900,000. (See under Cincinnati & Indiana, Railroad Construction, March 21, p. 217.)

Columbus, Sandusky & Hocking.—Announcement was made on April 2 by the general mortgage bondholders' committee to owners of general mortgage bonds who had deposited their bonds with the North American Trust Co., that the suits referred to in the instrument of transfer, after a number of hearings, had resulted unfavorably to the general mortgage bonds. As a result of this, after the property is sold, a sum approximating $4,000,000, if the proceeds reach that amount, will be applied in payment of certificates and bonds which have been adjudged prior to the general mortgage bonds. The committee, consisting of John S. Carlisle, Chas. S. Hinchman and Joseph F. Randolph, consider that this result deprives the bonds of any value likely to be realized from a judicial sale, but they have secured an option to sell the bonds on deposit for $50 each, less $15, which will be deducted for expenses, counsel fees, etc. Bonds which did not agree to this arrangement were sold at auction April 28.

Great Northern.—Additional Montana extension first mortgage 4 per cent. gold bonds of 1937 have been listed by the New York Stock Exchange to the amount of $2,278,000, making a total of $10,185,000 listed to date. (April 4, p. 258.)

Louisiana & Arkansas.—Announcement is made that a new issue of $1,500,000 5 per cent. 25-year bonds is to be made for purposes of refunding the existing $600,000 bonded debt, which is at 6 per cent., and for betterments and extensions. The total authorized issue is $4,500,000. The company operates a line 125 miles long between Stamps, Ark., and Winnfield, La., and a number of extensions are proposed.

Missouri, Kansas & Texas.—Notice is given that an issue of $550,000 additional stock is to be made to purchase the Missouri, Kansas & Northwestern and the Fort Scott, Iola & Western properties. The Missouri, Kansas & Northwestern is a new line from Mineral City, Kan., projected east by way of Columbus and Galena, Kan., and Joplin, Webb City and other points in Missouri, to Carthage. The Fort Scott, Iola & Western runs from Moran, Iowa, on the Missouri, Kansas & Texas, west through Iola, Kan., to Piqua, with a branch two miles long.

Richmond (Va.) Traction Lines.—A consolidation is to be made of the properties of the Richmond Traction Co., the West Hampton Park Ry. Co., and the Virginia Electrical Ry. & Development Co. These are to be purchased by the Merchants Trust Co. of New York, and are said to be worth in the aggregate about $23,000,000. The Richmond Traction Co. has $1,000,000 capital and $500,000 bonded debt. The West Hampton Co. has $300,000 capital and $150,000 bonded debt, and the Virginia Electrical Co. has $1,000,000 capital and $1,500,000 bonded debt. The Merchants Trust Co. now controls the Richmond Passenger & Power Co., which has $1,000,000 capital and $5,000,000 bonds.

Wilmington (N. C) Traction Lines.—A company known as the Consolidated Railway, Light & Power Co. of Wilmington, was formed at a meeting of the various interests represented April 23, to merge the Wilmington Seacoast R. R. and the Wilmington Street Ry. and Wilmington Gas Light Companies. The Wilmington Seacoast is now a steam road extending from Wilmington to Atlanta Station, N. C., 12 miles distant, and it is to be at once equipped with electricity. The Wilmington Street Ry. operates six miles of line, of which one and one-half miles is a steam freight dummy along the river front.